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ABSTRACT

Objectives of the Northern New Mexico Energy Education Project were to: (1) improve teachers' knowledge of energy-related subject matter and energy-related educational materials; (2) develop continuing communication and cooperation between elementary and junior high staffs and the university on energy-related matters; and (3) provide follow-up technical assistance to classroom teachers to prepare students for roles as citizens and consumers and to provide information on careers in energy-related fields. Included in this document are individual reports from teachers who participated in the project. Reports, related to the project's third objective, are grouped by the following areas: primary; intermediate; secondary home economics; secondary industrial arts; secondary mathematics; secondary science; and secondary social studies. Presented in the reports are energy-related activities, lessons, units, programs, information, and comments on the impact of the project on students. General areas addressed include energy sources, alternative energy sources, energy conservation, solar collectors/houses, fuels, utilities, and others addressing the needs of students in or subject matter focus of the areas previously indicated. For example, the construction of a solar food dryer by industrial arts students is described. (JN)

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NORTHERN NEW MEXICO ENERGY EDUCATION PROJECT

FINAL REPORT

PHASE II

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DECEMBER 1, 1982

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PHASE II
FINAL REPORT

Introduction

The long range success of this Project can be measured best by the effects the Project had on the lives of children. While the formal expression of this thought is stated as Project Objective #3,

> "To provide follow-up technical assistance to teachers at the classroom level, so that their students may be better informed regarding energy issues, thus preparing them for their roles as citizens and consumers and providing them a foundation for pursuing careers in energy - related fields."

The informal aspects are probably best determined by having the teacher participants share what they did with children at the classroom level.

Though the plan for the Project did provide for classroom visits, such brief encounters could not begin to describe the story of what children were actually doing and learning about energy issues as a result of the Project nearly as well as what the teachers themselves could.

Allowing these teacher participants to gather together in a remote conference setting, free from urban disturbances, and giving these teachers time to reflect and to share with one another the excitement of their respective classroom experiences in energy education seemed to be a logical way to prepare the draft of the Phase II Report.

It was such thinking which prompted the Pendaries Conference held October 1 & 2, 1982 in the beautiful Sangre de Cristo mountains of Northern New Mexico. With the aspen at the 9000 foot altitudes a golden yellow blended with an occasional bellowing of a bull elk as the mating season arrived, 31 teacher participants met at Pendaries Lodge to write the draft of the Phase II final report.

These teachers were selected on the basis of their performances during the follow-up phase of the Project. These were the teachers who went back to their respective classrooms following the workshops and enthusiastically introduced learning activities about energy to their students. These were the teachers who provided the "spark" to ignite the curiosity in the minds of young people about energy issues. These were the teachers who required little or no supervision from the Project Director and who willingly carried out assignments for the follow-up phase of the Project.

Other factors than performance were involved in selecting participants. In order to ensure that the end product would have wide dissemination value, a broad geographical representation was considered important. Children reared in metropolitan Albuquerque do not share background experiences with children who grow up in rural Northern New Mexico. There was also a need to have experience at all grade levels and a variety of content fields.

One positive effect of the Conference was not anticipated in the planning. As stated by a participant, "I've been teaching 15 years and this is the first time I've ever had an opportunity to work professionally on a common task with such a diverse group of teachers." The typical inservice experience for classroom teachers is segmented, even narrowing sometimes, rather than affording a view of teaching/learning problems from the broader aspects.

What follows is the story of the Conference as viewed by the 31 participants. Some organization of content is essential to tell the story in a logical manner. There is a "level by level" presentation of what these teachers did along with the impact of the Project on the lives of children. Yet, the reader is cautioned that each teacher was encouraged to be creative in relating these classroom experiences. The children were different and what teachers did will therefore be different.

Three general areas are addressed, all targeting on the Project's #3 objective:

(1) What each teacher participant did during the follow-up.

(2) How these activities influenced such learning objectives as basic skills improvement, etc.

(3) Suggestions for other teachers to follow in bringing the importance of energy matters to children.

P*R*I*M*A*R*Y

PAT DEVINE - LA LUZ ELEMENTARY - ALBUQUERQUE, NEW MEXICO

SHARON LECHALK - GIL SANCHEZ ELEMENTARY - BELEN, NEW MEXICO

MARIA TERESA VIOLA MARTINEZ - ESPANOLA ELEMENTARY - ESPANOLA, NEW MEXICO

GLORIA V. ATENCIO - PECOS ELEMENTARY - PECOS, NEW MEXICO

PEGGY LUCERO - PECOS ELEMENTARY - PECOS, NEW MEXICO

MARIA TERESA VIOLA MARTINEZ - ESPANOLA ELEMENTARY - ESPANOLA, NEW MEXICO

PRIMARY

Pat Devine
La Luz Elementary
Albuquerque, NM

The setting of the school is in the North Valley in Albuquerque. Most of the families are second and third generation residents. The income level is fairly low and the majority of the students participate in the reduced or free lunch program. The background of many students is limited as far as experiences and travel. In the main they are of Hispanic descent.

There were 21 children in my classroom. They were well-behaved and good workers representing a wide range of ability from very low intelligence to high average.

Projects

Shadow Tracing - I've wanted to see the sun's effect in producing shadows during the day. A boy and a girl were selected as models for shadow tracing. Since our classroom has an outside exit to a blacktop area it was convenient to make frequent tracings.

Each hour from 9:00 until 3:00, we went outside. The two models always stood on the same base point and I used different colors of chalk for tracing to produce a more graphic picture. The class as a whole participated through observation that day. They predicted what would happen at the next tracing. The rest of the week they repeated the activity in pairs without my help.

This activity promoted an awareness of a predictable daily pattern. The children participated enthusiastically.

Heat as Energy - The teacher of the gifted class in my school cooperated with me in a project on heat energy. Her students came to our classroom with two demonstrations. My class was divided in half so that a smaller group observed the simultaneously on-going activities. The observers switched locations upon completion of the experiment.

Experiment One used air from heated water to inflate a balloon. A bottle was placed in a pan of water; on the opening of the bottle was a balloon. The pan of water was set to boil on a hot plate and gradually the balloon began to inflate.

Experiment Two used heat to make a change. Two pie tins contained ice cubes. One was set aside and left alone. The other was held over a candle flame. The children could see heat speed up the melting process.

These demonstrations were well-received by my students. It is fun for them to learn from other children. The entire activity was videotaped by the gifted teacher (Barbara Casaus) and me so it became an especially good tool for evaluation.

PRIMARY

Sharon Lechalk
Gil Sanchez Elementary
Belen, NM

Gil Sanchez Elementary School is located six miles south of Belen. This is a rural community. The children are bussed from approximately a 25 mile area, including Jarales, Veguita, and Bosque. Their parents work varies from farming, the railroad, and may commute to work in Belen and Albuquerque. The majority of children have Spanish surnames.

The school is seven years old, built of white slump rock in the middle of a 30 acre area. There are no windows on the outside perimeter. The design is open classroom pods connected by the slump rock and including gates leading to the playground area which is to the west side of the primary building. The room entrances all surround a landscaped patio. I teach one of the two first grade classrooms, and often science and social studies are combined. My class enrollment was 26 students; 15 girls, 11 boys.

Our projects included introducing the concept of energy, energy people need to work, energy to plants, and energy sources and resources. The importance of the sun was stressed in an effort to show how it affects our environment.

I began by relating energy to the children in connection to health and food. We charted and discussed foods we eat, importance of meals, especially breakfast. We cooked a balanced lunch at school. The children learned that we can work because of energy produced by the foods we eat.

A resource person from P.N.M. came in to present "What Is Energy?" This presentation related the sun's stored energy in fossil fuels and how these are converted to electricity and natural gas, etc. for our conveniences. We then included energy conservation and our part in helping this. We drew pictures of ways we use energy and how we might conserve energy.

Out next project was plants and the importance of the sun as an energy source. We put healthy plants away from the sun and compared and charted the results. We kept daily records of temperatures in October and November, outside and inside to show the changing season and the effect seasons have on our environment and for people and plants. Also, to help children understand that some surfaces let some things out while they keep others in. We painted cans dark and light colors. We added water and later compared temperatures. We did this inside the room with covered and uncovered containers.

The last project we did showed evaporation and the water cycle. We constructed a model using a covered aquarium, heat lamp and dry ice. The children seemed most excited that it rained in the mountain areas first. We then noted when it rained at school, the length of time it took for the sun to dry the playground and where the water went. We did smaller experiments in the room with a teaspoon of water in dishes and noted how long it took to dry up - what happened when the dish was covered, what effect the sun had. The children enjoyed the experiments when they helped and when results were visible.

Our projects followed the content areas in Health, Science & Social Studies. Math was included in comparing temperatures and finding the differences. Language Arts and Reading were included in our discussions, charts and relating the information to the second and third grades. Art was included in the pictures we drew and the bulletin boards we made for the room.

PRIMARY

Maria Teresa Viola Martinez
Espanola Elementary
Espanola, NM

I am an Early Childhood Education teacher at Espanola Elementary School, Espanola, NM.

The rural setting of this community provides a much natural material and a largely natural setting for young eagerness and excitement for learning.

The classroom as well as the school population is largely Hispanic. The Indian and Anglo presence makes the school and community tricultural and all three cultures enhance and enrich the total quality of life experiences in the Espanola Valley.

Families consist of (generally) 4-7 members and the northern Hispanic extended family patterns still exist and function well.

Objectives:

The following objectives and ideas permeated the selected activities and experiences in this Early Childhood Classroom in Energy Education.

1. Instill in young students mind's their personal responsibility for a cleaner, healthier, better environment.
2. To conserve and preserve nature and natural resources. (Plant-a-Tree-Experience)

3. To become aware of the dependence and interdependence of plants, animals, and human beings on this earth. (Plant-a-Tree, clean air and water posters and paintings, food dehydration, solar collectors projects and buildings.)

4. To depict graphically and verbally the experiences with energy, nature, conservation, preservation, conservation of natural resources, solar collectors and particularly social responsibility and proper attitudes in Energy use and conservation, by painting, drawing, writing, display, and sharing with the entire student body, thus including the basic skills development in Math, Reading, Spelling, English (Spanish), Writing, Etc. Also the Art and Fine Arts can be included by composing little songs, painting pictures, sculpting figures, writing poems.

MATERIALS: Plant-A-Tree-Experience

Seeds

Soil

Containers

Plastic Sheet

Black Paper

Progress Charts for Recording Growth Results

PLANT A TREE EXPERIENCE

The students and I went to my home on a nature study and observation walk. We gathered Honey tree seed pods and had many discussions on the wonderous qualities of a tree.

We also retrieved the apple seeds from the dried fruit experience and soaked the seeds in warm water, the children, aid and I collected milk cartons, made a small hole on the bottom of boxes, prepared a manure and soil mixture, filled the boxes and other pots with soil, wet the soil thoroughly and the children pressed the seeds into the pots with a plastic sheet and then a black paper to speed growth and placed in trays in a warm place. Six days later seedlings began to appear. The children assumed water care and moving into some sun (mostly shade) area until they planted the trees at school or took them home. Great excitement, personal involvement and fun!

Evaluation: The awareness of plant growth, care and balance of nature became vivid and vital to children. They all became involved. More time and patience needed. Great attitudes about conservation, preservation, use, not abuse, were developed and hopefully internalized.

We posed the question: What has a tree done for you lately? The children painted their individual responses. The teacher displayed the paintings-in-response on the cafeteria bulletin board for the entire school to admire and benefit from in their daily cafeteria rendezvous. Later the teacher prepared a class album with these paintings.

Evaluation: Judging by the comments the children made, this was a quite meaningful experience in internalizing the interrelationships of all things in nature, the care and preservation needed to maintain a balance in nature and a responsible review of what we need to do on a day to day basis in order to use but not abuse the good things of the earth.

Suggestions for colleagues:

1. Allow more time for preparation of objects by discussion and attitude building.
2. Trade projects with other classrooms as well as with other schools.

SOLAR COLLECTORS AND FOOD DEHYDRATION

MATERIALS:

1. Cars and Trucks
2. Apples or Other Fruit in Season
3. Paring or Coring Instruments
4. Wire Trays
5. Butcher Paper, Dark Colors

SOLAR COLLECTORS AND FOOD DEHYDRATION EXPERIENCE

The students and I, in experimenting with color, solar energy and foods, gathered in the treeless faculty parking lot and observed the differently colored vehicles, proceeded to touch and discover the differences in heat absorbed by light colored vs. dark colored vehicles.

The children and teacher brought apples to school, washed, peeled and sliced thinly and placed the apples on wire trays the teacher brought to school. The group enthusiastically went out to my car and several other teachers and secretary vehicles and placed the sliced apples in the already very hot cars and watched the sun dry out the fruit. The children took turns turning the fruit and finally after three days, gathered the clean, (no dust) dried fruit, mixed it with raisins and peanuts, and enjoyed a graced healthy and nutritious snack.

Evaluation: This experience became a real "hands-on" activity enjoyed by all because all became involved. The various other classrooms and teachers also became enthusiastic. They furnished the use of their cars, and the students ate their snack. This also promoted further home drying activities and set the style for more nutritious snacks at home.

PRIMARY

Gloria V. Atencio
Pecos Elementary
Pecos, NM

I am a first grade teacher in the Pecos Independent School System. We are located in a rural area. The children are transported into school from all the different little areas around Pecos. Such as Rowe, Glorieta, San Juan, North and South San Isidro, Colonias, and Tererro. Most children come from Hispanic descent. They are middle to low economic status. The school consists of 99% Hispanic and 1% other. The area is very picturesque and refreshing.

My class consisted of twenty-eight children of average intelligence.

The enthusiasm of these children is what motivated me to involve myself in the following projects. Also, the workshop I attended last fall was interesting.

The first project was a Solar Still. The objective was to have the children become aware of the evaporation and purification of water. The materials used were the following: roasting pan, salt and water and a sheet of glass to fit over the pan. The lesson was as following: I started out by tasting the two types of water and comparing the differences. My project directions are the following: Take the pan, and pour in some saline solution (that is salt dissolved in water). If it is a hot day, place the pan outside in a sunny place. Otherwise, place it behind a sunny window. After sometime, the water should

21 Silvia V. Atencio 1st Grade Pecos Schools 22

start to evaporate, the heat of the sun will cause some of the water to rise as vapor. The children will not be able to see the vapor unless it is so hot that alot of water evaporates, creating quite a cloud of vapor. After a while, you should see a line of salt around the sides of the pan. What we are doing here is separating the salt from the water. The water left at the top of the salt is distilled water.

In evaluation, I will supplement this lesson to one in our science projects. I felt the children got alot out of it.

Another lesson I did was a sundial.

Objectives: At the end of the lesson, the child will be able to: describe how the length of a shadow at noon changes during the course of the year and explain why, identify north, south, east, west.

Materials: piece of wood or heavy cardboard at least 1 foot (30 cm) square (size again can vary on the size of sundial preferred. A pencil or similar straight piece of wood, a lump of clay, a clock that is reasonably accurate. The children play an important role.

Introduction: Talked about the sources of energy.

Log: I talked about the sun directly. We talked about that people noticed that the sun changed its position in the sky during the day, shadows cast on the ground by the children's bodies changed their position. I then went to explain that besides telling time by the position of the sun in the sky, people discovered that could also tell

time by the position of their shadow. All the children at this point took turns throughout the two weeks on sunny days, of course, going outside with a sundial I created with their help almost as tall as them, to see their shadow and changes at different times of the day. At this point, directimality is also pointed out to them.

A follow-up we did was to shine a light into the sundial from different heights to show shadow lengths. We found out that the more directly overhead the light was, the shorter the shadow - being that we are in the winter months not the summer months, when the sun is high in the sky, throwing short shadows.

In evaluation: My reaction was good. The children had fun and I feel they learned alot, because they still talk about it and want to do it again.

PRIMARY

Peggy Lucero
Pecos Elementary
Pecos, NM

My name is Peggy Lucero and my teaching assignment is second grade at Pecos Elementary Independent School.

Pecos, New Mexico is a small rural village in the mountains of Northern New Mexico. Our school is presently two years old. It is situated on a mountain surrounded by pinon trees and breathtaking views of beautiful mountains. The atmosphere creates a fantastic learning environment for our children.

The children attending the school are bussed in from outlying communities surrounding Pecos which are: North and South San Isidro, Colonias, Rowe, Glorieta, Tererro and San Juan. The students are bussed in from areas as far as thirty-five miles.

My classroom consisted of twenty-three students of average intelligence, nineteen of which qualified for free or reduced lunch.

The school consists of 99% Hispanic and 1% other. Most of the people are middle-low class economic status. Most families consist of five members where the mother does not work.

The following are two solar projects that I did with my second graders:

Title: Building Solar Houses and Attaching Overhangs

Objective:

(1) The students will build Solar houses and attach overhangs onto the house.

(2) The students will learn directionality (north, east, south, west).

(3) The students will learn to attach their overhang to the correct side of the cube.

(4) The students will learn to build a cube.

(5) The children will learn to spell, north, south, west, east, compass, cube.

(6) The students will learn to use a compass.

Materials: tagboard, construction paper, scissors, tape, cube pattern, pencils.

Log:

(1) The children will trace the cube pattern and cut it out.

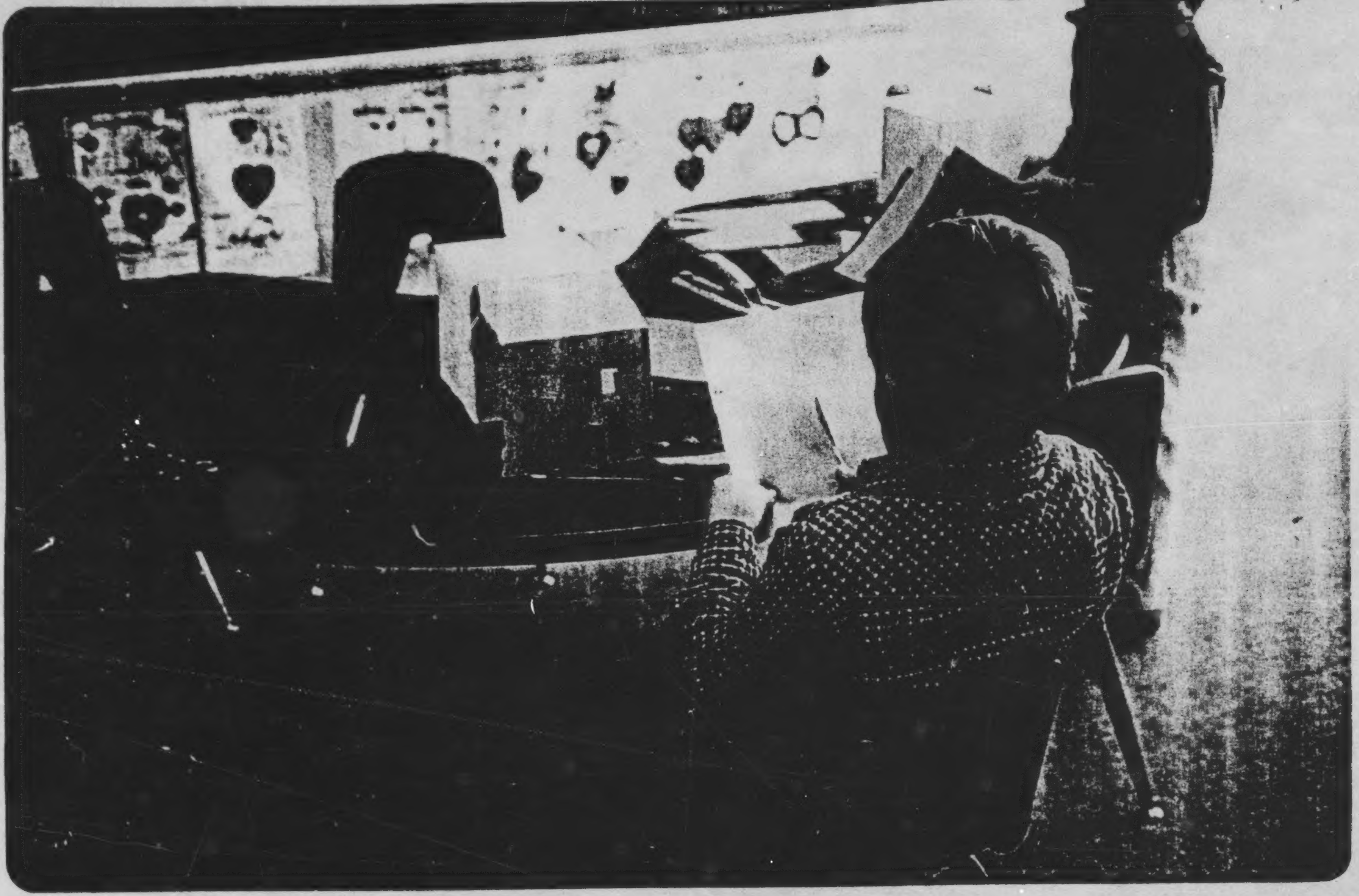
(2) The children will put the cube together by folding and taping it together.

(3) The children will do an activity using a compass to learn direction (north, east, south, west).

(4) The children will label their cube with each direction (N.E.S.W.)

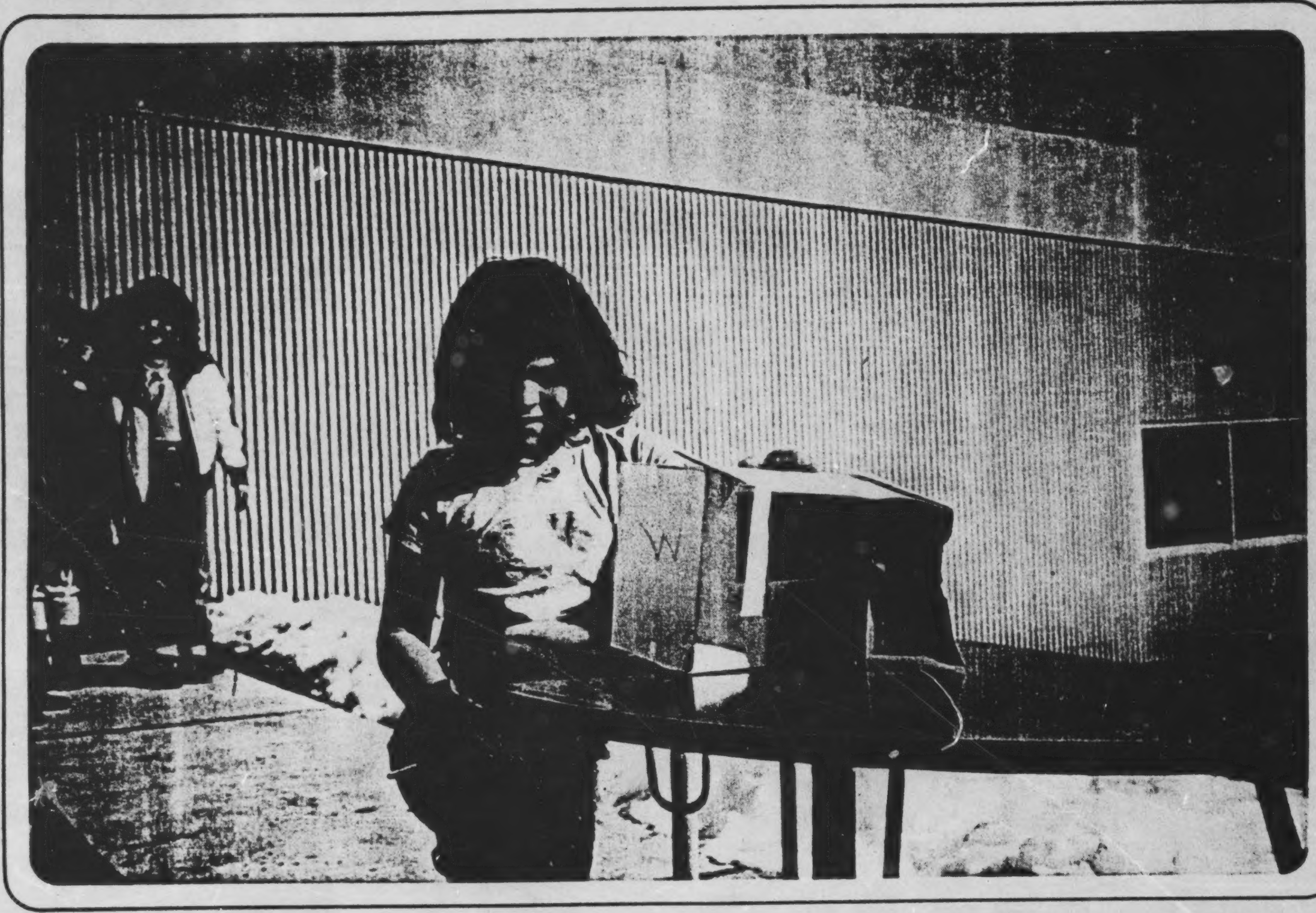
(5) The children will cut out overhangs and attach them to their cube houses.

Peggy Lucero Grade 2 Pieces



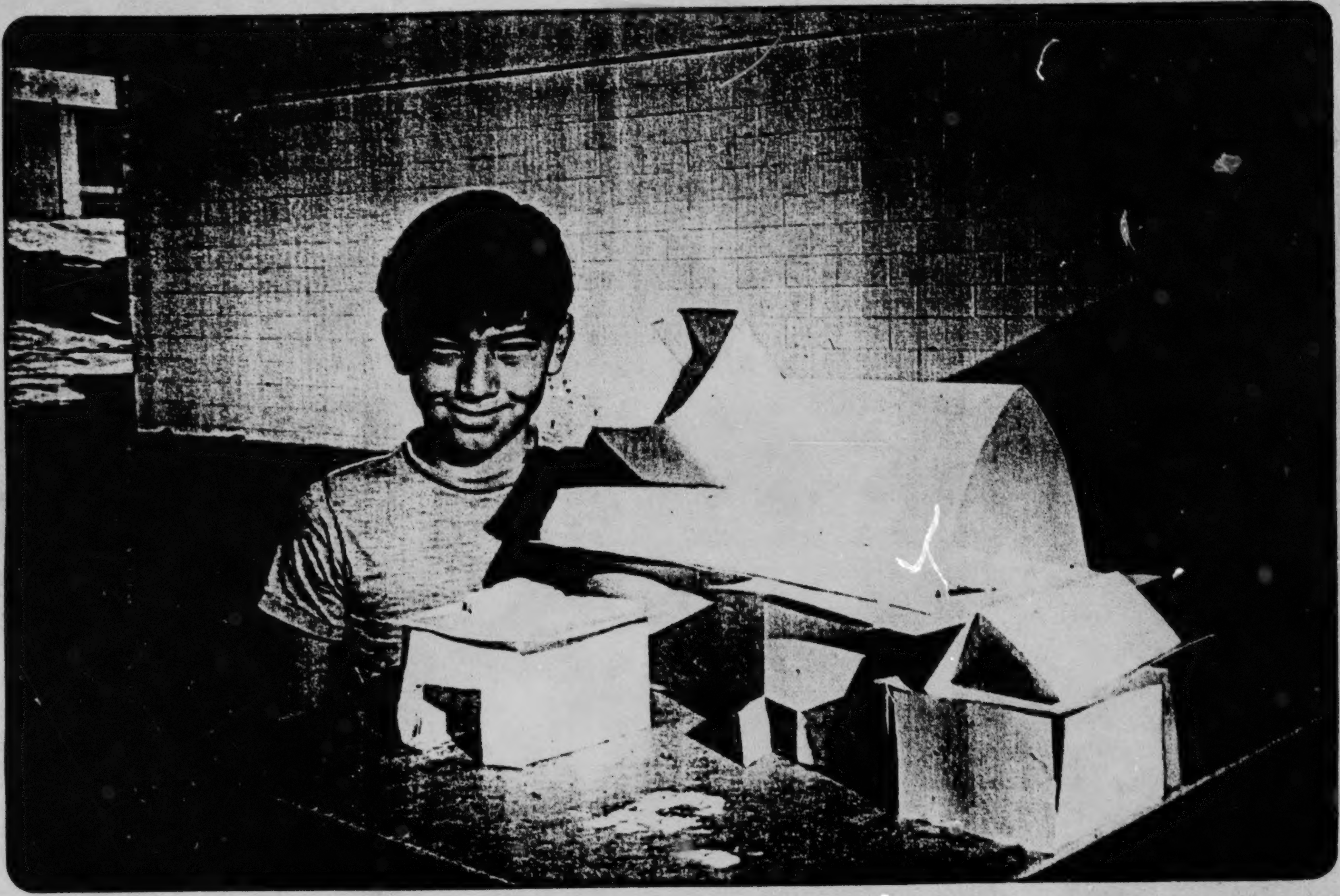
SOLAR HOUSE

Peggy Lucero Grade 2 Pecos

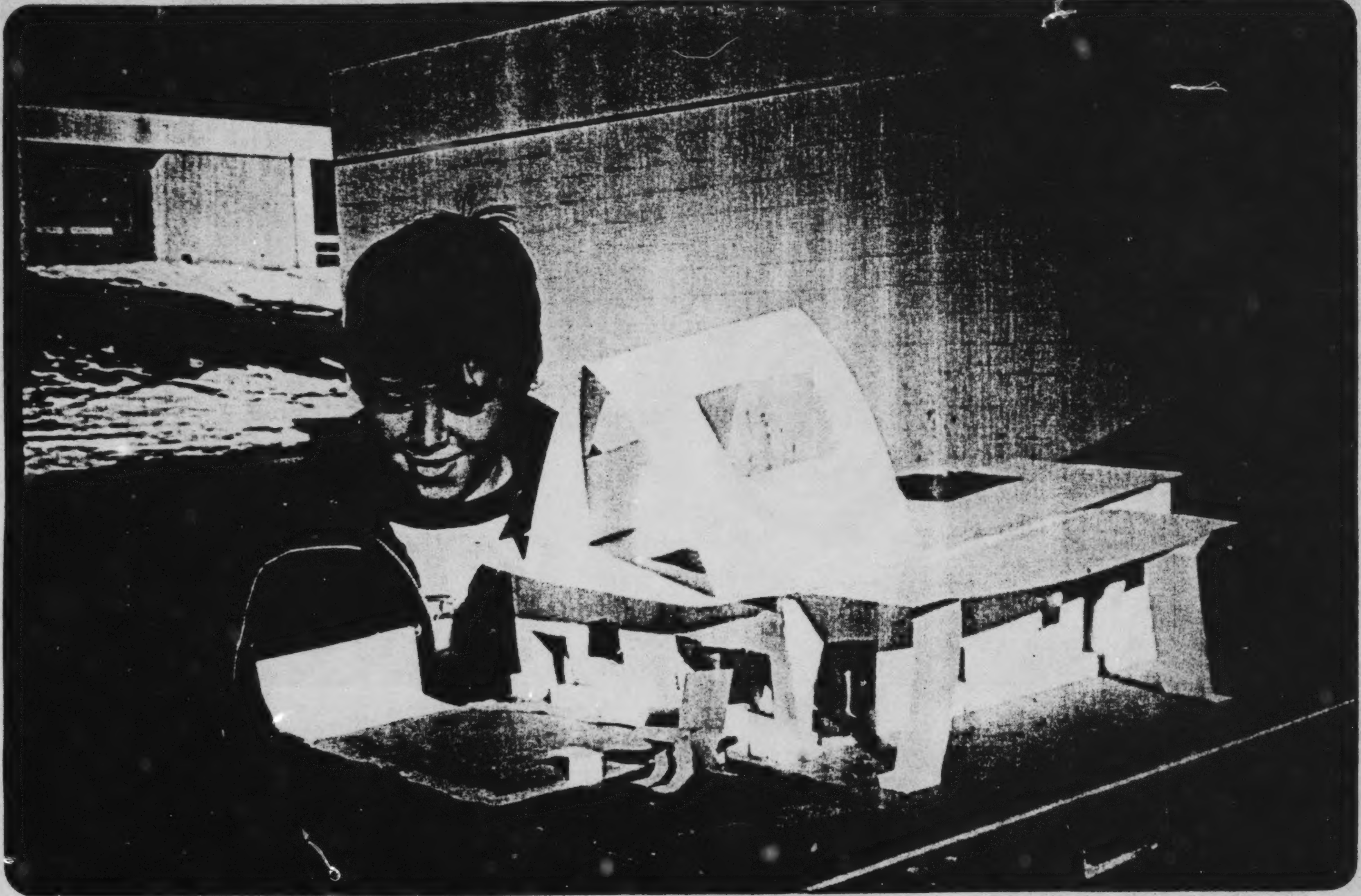


32 Peggy Lucero Grade 2 Pecos 33

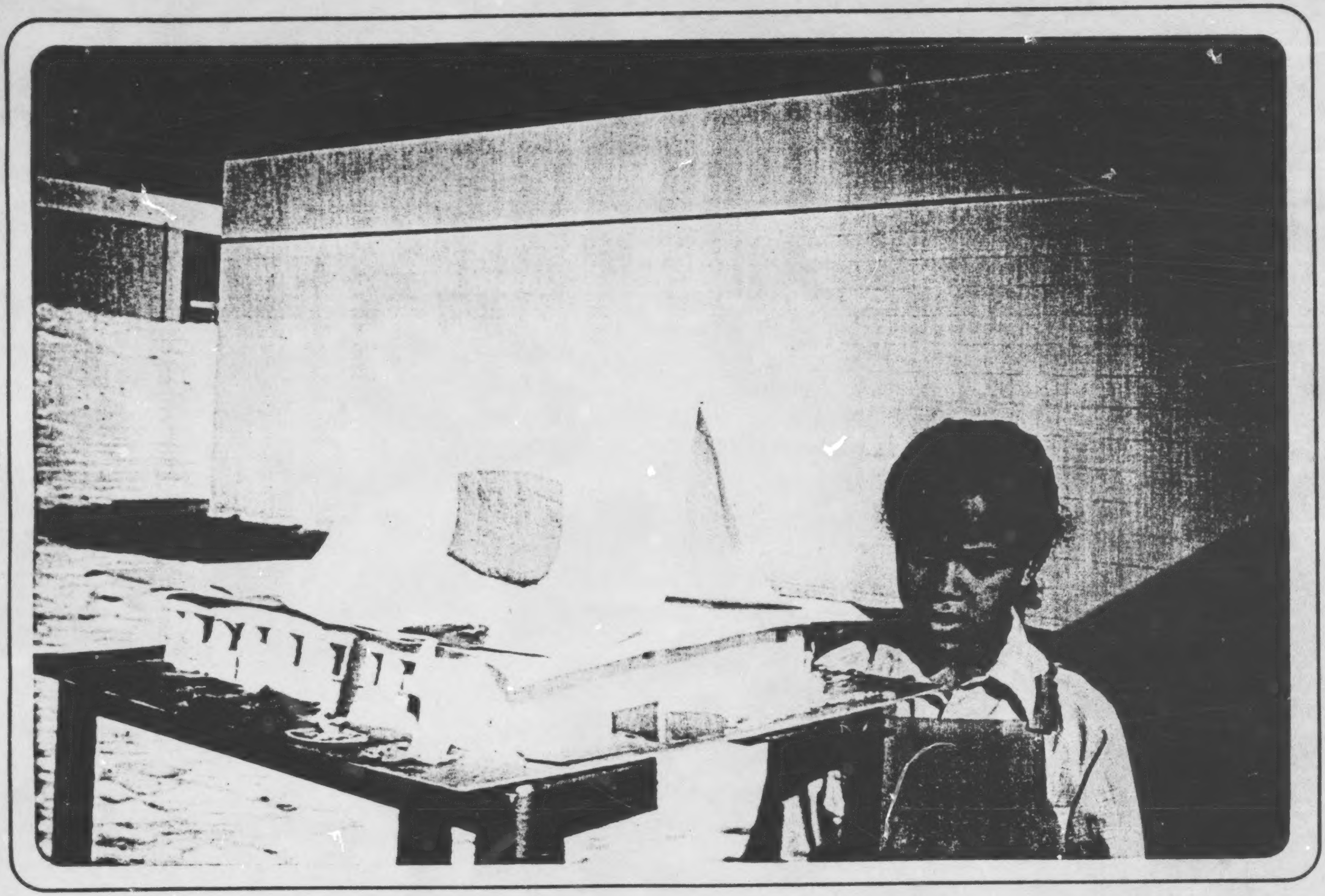
David Encinias- Gr. 4



Richard Ortiz- Gr. 4



David Maes - Gr. 4



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Chemen Denny- Gr.4

(6) The children will take their cube houses outside and test them in the sun to see and evaluate for themselves whether or not the overhang is placed in the correct side. (on the southside.)

Evaluation: My project went very well. The children enjoyed it very much, although, the next time I would build the solar house out of sugar cubes or popsicle sticks or some other resource. I found that cutting and tracing the cube was very difficult for my students. This project was so good for my children because they were able to evaluate their work by testing their solar house in the sun. They were able to judge whether or not the sun was being utilized and/or the overhang was helping to give shade to the cube.

The overall lesson was very successful and interesting.

I also brought an architect into the classroom to speak to the children about solar energy. What was very interesting and exciting was that Amy Loudarr evaluated the student's work. She also showed them pictures of solar houses and buildings she had done. The children really enjoyed meeting her very much.

Title: Sprouting Beans

Objective: (1) The students will sprout mock-eye beans.

(2) The students will learn that the sun and heat plays a big part in sprouting beans.

(3) The students will use their sprouted beans and make a Chinese dinner.

(4) The children will learn to make stir fry vegetables using their sprouts.

Materials: 3 large pans, cheesecloth, 3 rags, mock-eye beans, 1 wok, 1 bag celery, 1 bag carrots , 2 cans bamboo shoots, 2 cans water, chesnuts, cornstarch, chopsticks (for all students)

Log: (1) The students will place beans in pan with a little water and place cheesecloth over them.

(2) The students will make three pans of beans and put them in three areas in the classroom. One will be placed in the sun, the second on top of a high shelf, and the third one away from heat in the closet.

(3) The students will keep a log on which beans sprout first.

(4) The students will then read and follow directions in making chinese Stir-Fry Vegetables using the sprouted beans.

Evaluation: This lesson was so much fun. The students enjoyed eating their projects. This was a great learning experience. For most of my students this was their first experience tasting chinese food. The students also learned how the sun helped the bean sprouts sprout faster than the sprouts that were placed in the other areas of the room.

PRIMARY

Maria Teresa Viola Martinez
Espanola Elementary
Espanola, NM

2

Energy Education Colleagues Suggestions

1. Invite other classes to see your project.
2. Give sample lessons to teachers (colleagues) at their grade level.
3. Circulate resource material on Energy/Solar Projects such as Solar Projects by A. Joseph Garrison.
4. Talk about energy projects in Teacher's Lounge.
5. Make lists available (of resource persons) in Energy Education/Conservation.
6. Arrange for public displays so that teachers, and community at large (at bank, library, etc.) can know and share knowledge.
7. Share Science Fair displays (for entire school).

Energy Education Project Impact

1. Mother's and siblings both became involved by:
   *doing - building
   *eating - product (food)
   *seeing immediate results
   *choosing advantageous experimental locations (outdoors vs. indoors)
   *allowing child to share project knowledge, product and results with parents and siblings by taking items home and cherishing them.

I*N*T*E*R*M*E*D*I*A*T*E

CHRISTINE SANCHEZ BRANDL - ANTON CHICO ELEMENTARY - ANTON CHICO, NEW MEXICO

CAROL A. KREIS - BANDELIER ELEMENTARY - ALBUQUERQUE, NEW MEXICO

MARIA MATHES - PECOS ELEMENTARY - PECOS, NEW MEXICO

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MARY YARGER - PAUL D. HENRY ELEMENTARY - LAS VEGAS, NEW MEXICO

INTERMEDIATE

Christine Sanchez Brandl
Anton Chico Elementary School
Anton Chico, NM

Anton Chico Elementary School is located in Anton Chico, New Mexico which is a small farming community surrounded by yet smaller farming villages. The Pecos River winds its way through these villages, from which approximately ninety percent of our K-8 students are bussed. They are bussed in from a radius of 20 miles from such ranches and villages as Park Springs, Tecolotito, La Loma, Dilia, El Llano, Los Sisneros, Plaza Ariba, and Dahlia. The remaining ten percent live in Anton Chico.

Our student population is presently 118 students from K-8, enrolled in double grade combinations. Due to our small enrollment, we are of necessity a small staff, therefore our teaching assignments are usually split assignments. In the morning I am responsible for the bilingual instruction of the third and fourth grade students. In the afternoon I am responsible for the school's media center and instruct the library skills program for the K-8 students.

My third and fourth grade is comprised of twenty-two students; seven girls and fifteen boys. Ninety-five percent of my students come from low-income homes and qualify for the free federal lunch program. The remainder of the students qualify for the reduced rate on the lunch program. Ninety-eight percent of the students are of Hispanic origin and are bilingual in the English/Spanish languages. Approximately seventy-five percent of the students come from migrant laborers, who work the agricultural areas of Texas, Kansas, and Colorado during the late spring, summer and early fall, returning every year to the Anton Chico area which is their home. Often times in the winter months the fathers of these children leave their homes to find work in the Grants and Farmington area of New Mexico.

THE FOSSIL FUELS - - - OUR NATURAL RESOURCES

Objectives:

1. The student will become familiar with the history of oil.
2. The student will become familiar with the history of natural gas.
3. The student will become familiar with the history of coal.
4. The student will know the fossil fuel resources available within their own state of New Mexico.
5. The students will become aware of their own state's role in the United State's energy well-being.
6. The students will know the chronological development of energy-related inventions and events.
7. The students will be able to discuss possible solutions to the problem of America's increasing energy demand.
8. The students will become aware of the possible importance of the Santa Rosa Tar Sands to their local future economy; and their state and national's energy well-being.
9. The students will be able to work in small groups to complete various fossil fuel topic projects.

Materials: The materials listed below were used to supplement Unit Two in our Social Studies Text, "How Do We Use our Natural Resources?" from the People and Resources, Silver Burdett, 1979.

1. Twenty-two copies of Gulf Oil Corporation's pamphlet titled: "An Eagle Eye on Energy."
2. Twenty-two copies of Chevron Instructional Unit: "Energy Learning Center" - - - Fact Sheets 7, 8, & 9; 13, 14, 17 & 18.
3. World Book Encyclopedia.
4. Poster size pictures taken from 1980 pamphlet: Gulf Oil Corporation and Alternate Fuels.
5. Poster size outline of New Mexico, and fossil fuel symbols (coal car, oil well, gas flame) that can be added to the poster as each is discussed.
6. Construction paper, scissors, tacks, drawing paper, crayons, felt tip markers, magazines.
7. Two filmstrips: Coal, An American Asset and Energy Resources.

Teacher and Student Activities Chronological Log:

1. Introduction of lesson by teacher through the use of many materials received at the energy workshop.

2. The students as a class read and discussed pages from "An Eagle Eye on Energy" concerning the fossil fuels; their history, uses, etc. This assignment took three days; in conjunction we also covered Fact Sheet 7, 8, & 9 during this same three day period.
3. The students did individual reading in the encyclopedias to gain further background on the fossil fuels.
4. Now armed with sufficient information both students and I proceeded studying about fossil fuels by breaking into small groups of four to five students per group for various projects dealing with the fossil fuels.
5. I worked as a facilitator moving from group to group, most of the group projects took from two to three days to complete, during our regularly scheduled social studies time. Projects included were:
   (a) An energy time-line
   (b) An energy information center
   (c) A petrochemicals crossword puzzle
   (d) Interviews with senior citizens about recollections of energy sources at home and school when he/she was their age.

6. The next thing we did after our projects were completed was to regroup as a class with each group sharing their projects with the rest of the class.
7. Reading and discussion by the entire class of Fact Sheets 13, 14, 17 & 18 was the final task before the wrap-up.
8. Wrap-up: Viewing followed by discussion of the filmstrips mentioned previously.

Evaluation: This lesson was an excellent way for me to introduce the fossil fuels to my students. It gave them and understanding of energy - - where it comes from, where it goes, and ways everyone can attempt to conserve it. Our various projects and shared results served as reinforcement for the students' understanding of energy. We all learned a lot from this first exposure to the topics and what's more we thoroughly enjoyed it !!

Suggestions: I think the major changes to this lesson will come as a result of my being more familiar and comfortable with the bulk of material the second time around. The first presentation of this lesson was totally new to me as well as the students, therefore, the time devoted to the total dissemination of all the valuable background information was quite lengthy. I'm sure next time I can zero in on the most crucial points, etc. and thus take less time with the preliminaries.

The lesson customarily taught at this time is Unit Two in our social studies book, "How Do We Use Our Natural Resources?" This unit only deals with the natural resources of coal as discussed through seeing change in a mining community, and the natural resource of food as seen through change in a farming community. I decided this would be an excellent time for me to expand the lesson to include the other two fossil fuels. I, therefore, integrated them into this unit with the aforementioned lessons and projects.

Note: Later in the school year I was fortunate enough to have two resource guest speakers come to my classroom for review and reinforcement on the topic of fossil fuels:

(1) Dr. A.J. Budding, a geologist and professor at New Mexico Tech.: Topic Title: - - Tar Sands, Oil For the Future.

(2) Dr. Christina Balk, a geologist and retired professor from New Mexico Tech.: Topic Title: - - The Fossil Fuels, What Makes Them.

The resource speakers were made available to our school district through the 1981-82 Twenty-Second Visiting Scientist Program, sponsored by the State of New Mexico.

STUDENT SCHOOLHOUSE ENERGY SURVEY

Objectives: The student will be able to:

(1) Read and understand the Schoolhouse Energy Survey Form.

(2) Conduct the Schoolhouse Energy Survey.

(3) Evaluate his/her findings in a general debriefing session.

(4) Record his/her findings onto the Energy Survey Report Form.

(5) Present the Energy Survey Report to the building Principal, with his/her recommendations for improved energy conservation efforts school-wide.

Materials: Note: The following materials were selected to supplement our Social Studies Text People and Resources, Silver Burdett, 1979. The unit titled, "What Would You Do?", emphasizes the decisions confronting our youth as they begin to enter the adult world. I decided to integrate the Schoolhouse Energy Survey lesson with this unit as a very positive and active way for my students to make decisions and recommendations in their "right now world", (experience is the best teacher), instead of merely reading about decisions and policy makers in a very abstract way.

(1) Student Schoolhouse Energy Survey Form

(2) The Energy Survey Report Form

(3) Entire School Plant Facilities and Keys to All Areas

(4) Business Office Records on Fuel Consumptions

(5) Tape Measure

(6) Compass

(7) Light Meter

Teacher and Student Activities Chronological Log:

(1) Before conducting the actual energy survey, I reviewed with students the set of questions and activites in the Schoolhouse Energy Survey form. Each child was asked to take the form home to study and become thoroughly familiar with it.

(2) I set up specific times for my students to visit with and interview the various school personnel who would help with their gathering information for their forms, eg., custodian, cafeteria workers, secretary, principal, librarian, teachers, etc.

(3) Students and I proceeded with the physical tour of the school plant facilities. We were accompanied at all times by our custodian as we wanted to make him feel part of the "team". Our tour included both the outside and inside of the school.

(4) The students were asked to note down on their forms the following on their outside tour:

    (a) The configuration of the building, is it shaped like an E, H, T, L, rectangle, square, etc?

    (b) What direction does the front of the building face? What direction do the major entrances face? Which way does the prevailing wind blow? Does the building have any protection against prevailing winds, etc?

(c) What is the approximate percentage of wall area occupied by windows. What direction do windows face? Are they tight-fitting? Can they be opened? Are they double-paned?

(d) Can the windows be double-paned or replaced by insulated walls? How would this affect the internal illumination? Are any windows cracked or broken?

(e) Do the exterior doors seal tightly? Are they out of allignment or do they close too slowly? Should double or vestibule doors be installed? When the doors are open is there a wind tunnel effect in the halls?

(f) Are the exterior walls in good condition and do their colors affect energy usage?

(g) Are security lights effecient and effective? Do they actually reduce vandalism? What would happen if they were turned out?

(5) The students were asked to note down on their forms the following on their inside tour:

(a) Note the light levels in the various areas of the school, classrooms, halls, restrooms, cafeteria, library, etc.

(b) Have any lights or exhaust fans been left on needlessly in unoccupied areas? What type of lighting do the various rooms have? Are switches easily accessible? How is natural light utilized? Are windows kept clean?

(c) When visiting the kitchen note the pre-heating practices, baking schedules, and all types of energy-using equipment necessary to produce the meals.

(d) Count the exhaust fans located in all areas of the school. Are they controlled by easily reached switches? Do they have dampers?

(e) Are hot water heaters properly checked and maintained at correct temperature levels for each specific use?

(f) What are the Heating/Cooling systems like? How much fuel/energy does it take to run them annually?

(g) Are the walls and ceilings insulated? If so to what extent?

(h) Do any water faucets drip? How Many? Where are they located?

(Note: During procedure 4 & 5 above, I as the teacher, acted as a facilitator.)

(6) The next thing we did was to return to our classroom and proceed with the debriefing session on the following day. The debriefing was done in one class period via discussion, question and answer, summarizing, etc.

(7) On the following day (fourth day of the lesson), the students with my assistance arrived at con-

clusions and recommendations for improvements, recorded such on their Survey Report forms.

(8) On the fifth and final day of our lesson the students met with the principal to turn in the Energy Survey Report, with its overall energy efficiency rating very positive, along with several recommendations for improving energy conservation schoolwide.

(9) We decided to share our findings with the entire student body by giving copies of our report to every classroom teacher in the building, and asking them to disseminate the information to their students.

Evaluation: This lesson was very successful in helping my students proceed from their very general vague and often times, ambiguous knowledge of energy consumption to an energy awareness that to them became very specific, individualized, and personal. I might even go further to say that it helped many of them develop an expertise in the field of energy conservation. The students became so involved with this project that they decided to go forth with a unified commitment to energy efficiency.

A change I would make, would be to give the children a little more background information as to the effects of lighting, color, insulation factors, windows, etc. before we actually conducted the survey, so as not to take as much time answering questions along the way.

Note: Our school district superintendent, Mr. Albert N. Sanchez, just happened to drop by to visit my classroom on the day the students were preparing their written report to be presented and turned in to the principal. He was very impressed with their efforts on energy conservation and asked for a copy of the report for himself and the school board members.

Because of the Superintendent's interest, I was able to carry this lesson one step further than I had initially planned. A group of my students were able to present their Energy Survey Report with all their findings and recommendations to the school board members. Hopefully in the coming school year, the students will see some of their recommendations adopted by the Superintendent and School Board for implementation.

CONSERVATION OF OUR ENERGY - CONTROLLING THE RATE OF CONSUMPTION

Objectives:
(1) The student will be able to analyze the effects of conservation compared to unlimited consumption.
(2) The student will be able to determine that resources will be available for a longer period of time if we control the rate of consumption.

Materials:
(1) Two chocolate chip cookies per child.
(2) Clock with a second hand.
(3) Chalkboard for timegraphs.
(4) Graph paper and pencils.

Teacher and Student Activities Chronological Log:

(1) I gave each child a cookie and explained that we were going to time them as they ate. I also reviewed with them the graph format we were going to use to record the time. Each cookie was likened to a coal deposit.

(2) I gave the signal for the children to begin eating the cookie. Each child had to raise their hand when they finished. We counted the hands that were raised every 15 seconds until the cookies were consumed. At the last count all hands were raised.

(3) From the above procedure we were able (as a class) to create the graph.

(4) With my assistance the students were able to interpret the graph; via a question and answer period: eg.

   (a) After 15 seconds, how many coal deposits were consumed?

   (b) After 30 seconds, how many coal deposits were consumed?

   (c) After 45 seconds, how many coal deposits were consumed?

   (d) After 60 seconds, how many coal deposits were consumed?

   (e) After 75 seconds, how many coal deposits were consumed?

(5) The second part of the lesson began with my distribution of the second cookie. This time the children were only allowed to take a bite only when I said, "Take a bite" (every 15 seconds). The system for recording the results was the same -- the students raised their hand when they finished and I tallied every 15 seconds.

(6) We constructed our second graph, I on the chalkboard, the students on their individual dual graph paper. We, of course, used the same format as we had previously used. Our second graph indicated that coal resources lasted much longer with our conservation effort.

(7) The students were asked to compare both graphs to determine cookie (coal) consumption and the length of time for all resources to be eliminated.

(8) We compared Graph #1 (unlimited consumption) to Graph #2 (limited consumption). When interpreting the data, I had the students go one step further by having them give their results in multiples of 10 & 100. This was done to show the implication for actual coal deposits and rates of consumption.

(9) Students next had to answer such questions as:
    (a) Tell why you think coal was consumed at different rates?
    (b) How did we control the rate of consumption on our second experiment?

(c) Does this have any implications for us as we use coal, electricity, and natural gas?

(d) Can we help control how rapidly we use resources? Give your own ideas on how to do this.

Evaluation: My reaction to the way in which this lesson proceeded was on the whole very positive. My students responded with such enthusiasm (no doubt because they actually got to eat two cookies before lunchtime)!

INTERMEDIATE

Carol A. Kreis
Bandelier Elementary
Albuquerque, NM

Our classroom was a bundle of energy! My fourteen fourth and fifth grade students had previously gone to eight different elementary schools in Albuquerque. For the first time they were being bussed to Bandelier Elementary, a small old school in a pleasant residential neighborhood, to attend a school program designed specifically for first order gifted (IQ 145 and above).

There was some diversity in their backgrounds, but the majority were from upper middle class homes with parents involved in professional careers. All of the children had done some traveling, and several had been to Europe.

Their academic talents varied. All of the students read at or above grade level. Several had artistic talents, and a few showed a superior aptitude for mathematics.

The general goal of our energy studies was to give the students a broad interdisciplinary knowledge base. They needed to learn what energy is, the kinds and sources, and the nonrenewableness of fossil fuels. They needed to grasp an understanding of the complex role energy plays in our society, and also gain insights into their personal use of energy.

The emphasis was to provide a diversity of activities which would strengthen basic skills and allow students to grasp fundamental energy concepts.

Initially, our focus was on gathering information. Students surveyed the energy pamphlets displayed in the classroom and shared the information orally with the class. Everyone also brought in energy related current events. We discovered that almost all of the news can be tied in with energy! We saw films available through Public Service Company and Gulf Oil which discussed the basic types of energy, looked at historical uses of energy, and discussed the concerns of the present and future.

As we gathered information, we were involved in many language arts activities. We had a large sheet of butcher paper which we used to collect the unique vocabulary words, such as fusion and reusable, that we came across as we learned more about energy. The students' comprehension of energy came across in poetry lessons. The following are several examples of student work:

Once I was a piece of oil shale;
Now I am a tire.
Once I was a piece of coal;
Now I am fuel for a steam engine.
Once I was Natural Gas sitting under the ground;
Now I am in someone's gas range.

Jessica Goodkind
5th Grade

Once I was a dinosaur.
Now I am a fossil fuel.
Energy is life; we need it to live.
It is the only thing that we can't give.

(Con't.)

If it is taken away then we will cry.
'Cause without it we will die.

Lucy Ferguson
5th Grade

Whirling, swirling
All the drops form
    one unit of wet
Try to separate them
    you won't be able to
Every drop counts in life
Remember to compare water
    with tears
        of
            life.
Sizzling water brings heat in the form of a cloud.
Try to hold it,
    but you can't
Every burn is bad, but a steam burn is
    the worst of them all
Act fast, because we breath out clouds
Man is made of clouds
    we heat them.

Jocelyn Swigger
5th Grade

Language arts activities also included creative writing assignments and factual listing of information and summaries of information gathered. I read H.G. Wells The Time Machine to the class, and then students designed their own ideal machines and wrote about them. They made Rube Goldberg machine drawings and listed the steps involved in the operation of the machine. Students did independent individual and group projects and wrote up summaries of what they investigated. Topics explored included themes such as types of solar energy, the amount of pollution in the air as shown on vasoline smeared slides and the location and uses of coal resources.

Art work was utilized throughout the program as a means of self expression and as a way to see if students understood concepts. The class made energy posters, drew energy pyramids , and expressed a summary of what they had learned about energy in picture form at the end of the unit.

Math activities were of a personal nature. Students went home and read their electric meters. They looked at electric bills and discussed the cost of electricity.

Social studies was brought in through discussions of what our life would be like without electricity and predictions of where we are headed energywise in the future. Resource people from Public Service Company and the gas company came to our class to discuss our concerns with us and to add to our knowledge. We also visited the Atomic Energy Museum at Kirtland Air Force Base and got to see a demonstration there of the environmental simulator which is a computerized system listing natural resources and showing how they may be depleted in the future by various demands of our population.

As a grand finale we put on a play "Crunch, the Energy Eating Dragon" by Claire Boiko. As fourth grader Chris Stone wrote on the announcement for the play:

> "A kingdom is attacked by a dragon that consumes energy. It seems that nobody can slay it. The only person who can rid the kingdom of the dragon is Plumb, the royal janitor."

The script had meaning for the students because it related so well to what they were learning about energy. They had the fun of developing their theatrical talents and an opportunity to spread energy conservation information to the rest of the school.

I feel our energy studies were successful in broadening students' understandings of energy as evidenced by the investigations they made and the comments they made that related energy to other topics we focused on the rest of the school year. When asked to comment on what they enjoyed most and least about the program, the student answers were varied. As to preferences, several students said experimenting, several listed solar energy, four mentioned the Atomic Energy Museum, one mentioned Rube Goldberg machines, and one put down films. Over half the class said their was nothing they did not enjoy. Four did not care for the information on machines, and one did not like one of the films.

INTERMEDIATE

Maria Mathes
Pecos Elementary
Pecos, NM

Introduction: My name is Maria Mathes and I teach a fourth grade class in Pecos, New Mexico.

Pecos is a rural area in Northern New Mexico. The school is situated in an extremely beautiful area surrounded by mountains, pinon trees, and even a graveyard. The present building has been in use for one year.

The children are bussed in from many outlying areas, some as far as 30 miles. In winter these children often do not attend as the roads, particularly from Colonias and the Pecos Canyon, become virtually impassable.

The children are mainly of Hispanic descent, and come from a low socio-economic background. Families usually include four or more members, and are basically inter-related (extended families).

I taught a class of nineteen boys and eight girls. This particular class involved children with an extremely high energy level, very short attention span, and a reputaation for mischief. As a teacher, I actually "feared" getting this class as I knew they were responsible for a teacher aide being hospitalized for nervous tension. However, we accepted each other immediately.

Project: The energy project I selected had to be one that involved a tremendous amount of ongoing activity.

With discussion from the class, we finally settled on the construction of solar houses.

We commenced to discuss things in the sky and deeply delved into the sun as a prime energy source. The children arranged a bulletin board on the sun, its benefits, and man's use of its energies. They obtained the visuals from magazines and newspapers. We also used prisms to explain the refraction of light. Each child spent about 15 minutes outside experimenting with an individual prism. We also constructed solar systems out of yarn so that the children could understand the relationship of the sun and the plants, and how earth is ideally located for the reception of the correct amount of warmth. This whole procedure took about one week of class time - 40 minutes per day.

For the actual construction of the houses, I involved a resource person, an architect working with the "Artists in Residence" program.

Each child purchased a board that measured 2 x 2. We went into solar terms in depth - active, passive, collectors, mass, adobe, elevations, thermapane, greenhouse, southern exposure, etc. Each term was discussed, illustrated, and used in "solar discussion groups". I had the class divide into groups of four and quiz each other on the terms.

I then utilized the floor plans of my own home to illustrate elevations. Elevations did cause a lot of concern and confusion.

The next step was to draw floor plans on the boards. Scale was explained but this proved to be too much for my class. They found it an impossible task so I abandoned scale.

For the actual building we used tagboard, cellophane, and sugar cubes. Each child followed his design as closely as possible in the development of his home. They amazed me as I observed the total involvement. Each house was very different yet each expressed solar concepts as viewed by a nine year old. Some of the children even utilized popsicle sticks as vigas. Towards the end, landscaping was employed, as was furniture building. One child even purchased mini-tiles to utilize for brick floors.

Each house was photographed with the architect and a bulletin board was arranged for Open House.

Evaluation: As a whole, I found the lesson extremely successful. More important, the class did also.

The learning was unbelievable as was the exposure: gross motor development; motor coordination; eye-hand coordination; art; drawing; measuring; counting; reading.

The entire experience involved about six weeks of work. We utilized around one hour per day. If I would attempt this again, I would increase the daily work time as to shorten the project. I found it very time consuming to organize the daily work, and clean up after each task for six weeks. Also, toward the end, the children grew tired.

I found sugar cubes to be successful but quite "messy". Obviously, they served as adobes. For an older class, I would actually involve the students in adobe brick construction. My class, active as they were, enjoyed eating the cubes, and even crushing them (accidentally, but it did create quite a disturbance on the rug.) Glue also posed a problem. There are still souvenirs of solar project permanently embedded in the carpet.

Would I attempt this again? Yes, but on a smaller scale and with fewer children. I believe one possibility would be to utilize group rather than individual construction. The project was successful with the particular class I taught. It satisfied their energy levels and exposed them to an area of which most of the class was unaware.

INTERMEDIATE

Judith Miller
Fairview Elementary
Espanola, NM

I am a 5th grade teacher in a self-contained classroom at Fairview Elementary, Espanola, New Mexico. Last year I had 19 students at an average 10 years of age. Our school is officially recognized as belonging to the Bilingual Program and the majority of students are Spanish surnamed but in reality English is their first and home language. Our district is in general rural and parochial, students remaining in their community during grades K-6 and then bussed to a central location for 7-12. Small agriculture is the major occupation but many people are employed in the neighboring community at the Los Alamos National Laboratory. Fairview Elementary is reputed to have a higher concentration of students from more academically and socially advantaged homes (advantaged for our district - but not for the nation. The average reading level for this particular 5th grade was 4.0.)

Three areas we studied through classroom projects were (1) Energy Conservation at Home, (2) Water Conservation at Home, and (3) Recycling.

1. Energy Conservation: The object was to have students become aware they can save energy and money for their family without doing anything expensive or more complicated than being more aware of their actions and perhaps changing a few habits. I hoped through means of simple home assignments to have children in turn educate their parents.

No expensive materials were needed - just some free brochures from the Public Service Company which I duplicated. The brochures were suggested tips that any family could do at little or no expense to cut their home and car energy consumption.

After classroom lesson and discussion to be sure students understood the topics they were given various types of assignments to take home and enlist the entire family's cooperation. In Home Energy we used Checklists to look for energy wasters in and outside of the home; we practiced reading utility bills and then comparing the family's bills over a three month period to check if saving energy. We did writing assignments on any discoveries they made or how they thought their family could be more energy-conscious; interviews with senior citizens to increase awareness on our increased energy consumption.

A lot of energy waste is due to ignorance and bad habits. The first step is to educate parents and children. (1) There is a problem facing the U.S. (2) You can have an affect.

Skills: Increased awareness
Learning by doing and by teaching others
Reading skills
Math computation
Writing - personal experience
drawing conclusions

Oral language - interviews

Oral presentations in front of class

Contact with senior citizens

2. Water Conservation at Home: The object was to increase student's awareness that there is an increasing problem with water; that their combined efforts can have some effect. I needed no expensive materials being lucky to get 19 free samples of a shower head water saver that our local power company was making available to anyone who wanted one.

My lesson was intended to show through measurement how this water saving device could save water and electricity (or gas) over a period of time. I designed several dittos using measurement and math where they kept records on their families bathing over a period of time.

Skills: Increased awareness

Math skills (measurement, computation, graphs)

3. Recycling Pays: The objective was to increase students awareness (1) that our resources are limited, (2) that they can conserve existing resources, (3) that recycling helps our country as well as ourselves at the same time (4) what are pertinent energy issues discussed in relation to recycling, (5) a tangible reward for recycling.

After the lesson on recycling the students were given the task of collecting cans which melted them 1¢ a piece. Their goal was to collect 496 cans the dollar amount needed to buy paper cups, instant cocoa, popcorn, and baggies for a treat.

To launch the project, we also did some art work on recycling which we displayed around the school to educate others.

Skills Increased awareness

Evaluation: In order to find the time for the energy project, I had to make sure it coincided with the subjects I am required to teach daily. Luckily energy conservation lends itself quite well to assignments for Social Studies, Math, Science, Language and Art. I felt good about this because the topic of Energy Conservation is more relevant to today's student than some suggested by the normal text.

The recycling project worked best and was easiest from teachers point of view and most enjoyable for students because they reaped tangible results (a treat). The only difficulty was holding firm when the students tired of picking up cans and wanted to bring in money instead. But, once they realized they had to earn the treat, we went on to have four before school was over. My students as well as the rest of the school enjoyed the related art work.

The next most successful project was the interview with a senior citizen because many students were amazed at their discoveries. The resulting oral presentations in front of the class were good experiences from my point of view.

The math-related projects were moderately successful but need revision. The easier math skills, simple adding, subtracting, etc. related to the recycling project were easy for students. But when we moved on to comparative math, to graphs, to reading utility bills, they had a harder time. This was due partly to the lesson being so rushed and next year I would allow myself more time. I also feel if the project were started in the fall it would be better to have more bills to compare so any changes would show up.

Overall criticism, I feel, is that my projects were too vague for 5th graders. I needed to make specific assignments for them. I was so excited by the energy projects and believed in them myself. I thought my enthusiasm and commitment would carry over to the students. But the class results were that students whose parents were energy-conscious or experimenting with solar were the students who turned in the assignments. The students whose parents "burned rubber" or were material oriented didn't see the need or show any interest. There seems to be an indication that parent-education involvement is necessary. Many of my assignments were designed to include parents - but if they didn't see (believe in) any reason to help kids, it didn't get done.

I also feel student-made assignments would have been more effective. If after lesson and discussion, they suggested the types of assignments they would like most to investigate, it would force them to think.

INTERMEDIATE

Sylvia Mills
Zuni Elementary
Albuquerque, NM

Zuni Elementary is located north of Coronado Shopping Center and in the center of Albuquerque's busiest traffic. Therefore, pollution, especially automobile, is an increasing problem. The students are city oriented with little rural experiences. I had 33 students, average age - 10; 15 boys, 18 girls of which there were 14 anglos, 14 hispanic, 2 Vietnamese, 1 black, and 2 Indian. Seventy-five percent of the children were from divorced homes. All but one child live in homes where all adults in the family work. Economically, these are middle to upper middle income families; therefore, the students are high consumers. The parents have high expectations for their children and generally assume that their child will be college bound. Most were either a single child or the youngest child in the family, have many material possessions with little thought being given to the environmental, as well as economic, cost of these possessions.

Lesson One was a trip to Albuquerque Public Schools' Environmental Education Center. This is located on the east side of the Sandia Mountains, east of Albuquerque. It consists of outdoor mountain trails, a museum of energy exhibits and classrooms. The day was to serve as an introduction to the energy unit. It is taught by three environment and energy specialists. Their program objectives are:

I. To develop student understanding of how the Sandia Mountain forest community (plant and animal) functions by studying its:

   A. Use of natural energy

   B. Characteristics of adaptability and long-term survival

   C. Links of interdependence

   D. Sequence of recycling

   E. State of constant change

II. To compare and contrast the functions of the natural forest community and Albuquerque's man-made urban community by studying:

   A. Natural vs. human survival needs

   B. Natural vs. human forces that can change or rearrange the forest environment

   C. Natural vs. human methods of recycling resources

III. To develop student understandings that humans are totally (in)dependent on nature and its resources by studying:

   A. Where and how humans get energy and resources to run their homes and urban communities

   B. The ways humans use and abuse nature's resources and the resulting consequences

   C. The effects of expanding populations

   D. The ways in which humans can extend nature's resources by designing their urban communities to conserve and recycle nature's resources

They accomplished the first two objectives out on the nature trail. We examined different plants and animals and their growth in relation to the availability of sun and water. We held our hands up to the sun as solar collectors. We discussed how everything in nature is recycled and looked for evidence of this. We examined the wind generator which provides the electrical energy for the center.

After lunch, students went to the museum where we worked on the third objective. They viewed models of the Four Corners power plant, the Rio Grande Valley and its water table, a modern home, the sewage treatment plant, a solar hot water heater. We discussed the use of coal by the Four Corners plant and the problems of fossil fuels. We viewed lung tissue samples of a New York City emphysema victim. We discussed population growth. We discussed various energy sources concluding that all fuel sources come from the sun. Finally, we discussed the need for changes such as population control and recycling to extend nature's resources.

The second lesson was a trip to the Albuquerque Museum to see their solar exhibit, entitled "New Mexico Solar Heating: Yesterday and Tomorrow", and the actual solar heating equipment used by the museum building which is solar heated.

In addition to seeing the exhibit which showed examples of the use of solar heating from early Indian days to the present, the children were shown the buildings equipment and the maintenance supervisor explained how it worked and answered questions.

The third lesson was designed to help the students pull together all the information and ideas they had been exposed to and to begin thinking beyond the most common sources of energy in use today and to become aware of alternative energy sources for the future. The students could choose to make anything they wanted to demonstrate their knowledge and ideas of possible alternative energy sources.

They first selected an energy source and then decided on a project. There were solar dehydrators, hot water heaters, greenhouses, windmills, solar homes, posters, research papers, solar power cars, a lemon powered car, various solar cookers.

Evaluation: The Lesson One was highly successful in my opinion. More learning took place that day than I could ever impart from a textbook. The students are introduced to many new concepts and are started on the road to much indepth thinking about the energy issues. The change from the urban setting to a forest community that has succeeded for millions of years is a new concept for students. Most have never considered the mountains any further than a place for their recreational usage.

Lesson Two then was a good follow-up to see a public owned building applying good energy usage.

Lesson Three was o.k. I don't feel I got the depth in research that I desired. The kids enjoyed making their projects but there was a limited number who really researched what they built. This was largely a fault of time pressures of the school system. We were approaching district testing dates and I wanted the unit wrapped up before the testing began so I pushed for a finish date which really didn't allow for much research time.

The students felt they had gained because of the "doing" aspects of the unit rather than a textbook oriented approach.

The learning carried over into all subject areas although it was supposedly a science unit and was designed to supplement Heath's Science Unit on Energy.

I would do this unit early in the school year so that ideas from it could be further developed throughout the year. In Social Studies it could be applied to how energy affected the American History; in health, 5th grade studies the respiratory system and related pollution problems as well as environmental affects on health. Earlier introduction would allow for more ongoing math projects in economics and graphing.

It was a successful experience for the first time through.

INTERMEDIATE

Mary P. Tenorio
Legion Park Elementary
Las Vegas, NM

I teach a class of 28 fifth grade students at Legion Park Elementary located in Las Vegas, New Mexico in Northern New Mexico. Seventy-five of the students live within the city and 25% are bussed in from the rural areas of Los Vigiles, San Antonio, Camp Luna, and Romeroville. About 80% of students are of hispanic background and 20% of Anglo background. Most students come from middle to low income families with approximately 10 qualifying for free or reduced lunch.

Most students come from families where both parents work with family size averaging 5-6 persons.

Seven students take part in the Title I class, which means they are reading below grade level. One student is in the H.E.P. Class (High Educational Potential). The rest of the students are average and above, and quite serious with a good attitude and good study habits.

Our energy unit was introduced with a filmstrip on "Energy: From Where, For What, and For How Long?"

Objectives:

1. To give students a background on energy resources, energy definitions and energy problems.
2. To develop students' understanding that human beings are dependent on nature and its resources.

3. To give students an opportunity to examine energy concerns and ways in which humans can extend through recycling and save through conservation.

Follow-Up Activities:

1. We put up a bulletin board on Energy: Supply and Demand.
2. Conducted interviews with parents and grandparents to find what electrical appliances they used when they were 5th graders. Compared to what we use today.
3. Interviewed an adult in the community concerning environment, energy supply, cost and conservation.
4. Took home and discussed with parents a list of energy conservation tips.
5. Conducted activity "Reporter on the Street" where students observed traffic on Legion Drive and 7th street for
   a) large cars
   b) small compact cars
   c) driver only car
   d) buses
   e) trucks - goods transported
6. Interviewed three car owners on:
   a) type of car - why?
   b) miles driven per week
   c) miles per gallon

   Also asked car owner's if they believed there is in fact an energy shortage. 21 No 49 Yes

7. Activity - "There are Other Ways to Get from Here to There"
Students use Home as starting point to (1) school (2) shopping center (3) church (4) friends house (5) restaurant, and listed ways (other than car) to get there and how much longer it would take to get there and savings in energy.
8. Students conducted "Operation Observation" where they surveyed home and school as to: windows, doors, fuel, lighting, water heating, clothes drying, insulation, etc. and discussed ways to make them more energy efficient. Mr. Baca, our principal, provided us with utility bills for one month for Legion Park.
9. Students collected aluminum cans and took field trip to recycling depository.
10. Students put together all energy materials and information in Energy Booklets and took them home.

Evaluation: Our energy unit was highly successful in that it gave students an awareness of, and a background on energy resources and problems.

The unit gave students an opportunity to examine ways to conserve energy. I feel that the reason it was a success is that the students became totally involved, it was not all "book learning", but a very practical, hands-on experience.

It is very important that parents and community are aware of energy supply and demands. In this unit not only were parents involved, but also grandparents. We had parents, grandparents and community thinking "Energy"!

INTERMEDIATE

Susan M. Walczak
Assumption School
Albuquerque, NM

I am Susan M. Walczak. At the time I developed this unit, I was working with 3rd, 4th, and 5th graders at San Felipe Elementary School in Old Town, Albuquerque. These students came from a varried socio-economic background. I wanted to make students aware of the "possibilities" of recycling for them in their own local environment. I used all the local resources I could think of -- i.e., parents, phone book, PNM, etc. to give them information about Energy. With the information they had acquired, the students began to identify materials and methods for recycling.

After this was done, each individual class participated in a "collection experiment" in which, as a class, they did the following:

1. Chose a place to collect in
2. Collected recyclables in given amount of time
3. Took "collection" to recycling Center
4. Got the money
5. Decided what to do with the money

There was a high level of excitement and interest throughout this unit, because of the many speakers activities and fieldtrips. Many students decided it was a good way for them to earn money, but all the students decided the best part of recycling was spending the money.

RECYCLING ENERGY by Susan M. Walczak

OBJECTIVES

1. To make students aware of the amount of energy required to produce recyclable containers.

2. To familiarize students with recycling centers in the local area.

3. To make students aware of recycling advertising in the media.

4. To make students cognizant of the link between recycling and the protection of the environment.

5. To make students aware of the "profit ability" of recycling.

LEARNING EXPERIENCES AND STUDENT ACTIVITIES

1. Have a presentation by Mr. Nelson, production manager, on bottling and recycling as it is done at the Soft Drink plant.

   Student Activity: Have students draw a diagram of the bottling process as explained by Mr. Nelson

2. Present the "soup can" energy flow chart.

   Student Activity: Discuss the amount of energy required to make a soup can and compare it to the energy used in the bottling process mentioned above.

LEARNING EXPERIENCES AND ACTIVITIES

3. Go on a field trip to two recycling centers in the local area.

   Student Activity: Have students fill in chart on recyclable wastes, recycling centers and amount paid for recyclables. Then, have students research further information on recycling centers.

   Have students collect advertisements on recycling.

4. Have a P N M representative do the energy presentation for grades 3,4 and 5.

   Student Activity: Use P N M follow-up activities for each presentation.

5. Search out areas where recyclable wastes accumulate to determine which would be the best place to do a collection activity

   Student Activity: Using the information gathered through class observation and research,plan a field trip to a collection site and a recycling center of their choice. Students will spend one hour collecting, one hour on a picnic lunch and then take all recyclables to a recycling center. (All proceeds to go to the class treasury.)

EVALUATION

Make a poster illustrating the most important things you learned about energy and recycling.

INTERMEDIATE

Mary Yarger
Paul D. Henry Elementary
Las Vegas, NM

My class consisted of 28 students, about evenly divided boys and girls. The majority of the children live in a lower socio-economic area of Las Vegas along the Santa Fe railroad. The remainder of the class are bussed from an area of huge prosperous ranches and represent both the owners children and the children of the ranch hands.

This particular class was academically very low, having seven children who were chronologically one grade level behind. There were 11 students in Title I Reading, seven who were staffed from the Resource Room and one who was mainstreamed from C-level Special Education. They had an unusually large amount of home problems ranging from divorce, step-parents, step-brothers or sisters, to sibling or parents on the drug scene.

The group needed much motivation and projects which could provide material for the few bright students and would not be too challenging for the slower students. Any class projects needed to have both a wide range of ability levels, and also a practical slant.

With these guidelines, I decided to present a project of food preservation, the amount of energy needed for food production and some of the economics involved.

We started with a large supply of free apples. Northern New Mexico has these in abundance each Fall. Many apples are unsprayed or not well cared for, but they can provide good inexpensive nutrition.

We brain- stormed on the board how we could preserve our apples so that we would have apples in some form to use during the year. Each child kept a log of the project as we worked on it. During our brain storming session, such ideas as putting them in the refrigerator, drying them, cooking them into apple sauce, pies, etc. emerged. The children decided that since the apples were not in real good shape they sould use them as soon as possible.

Shortly thereafter, the group went on a trip to visit Mrs. Tyson, a local elderly resident who is quite into the entire field of energy conservation. She has a solar crop dryer which she explained to the children. Then she showed them the large variety of fruits and vegetables which she had dried. She let the children sample the various products and she told them how she uses them.

While the children were at her home she also showed them her solar water heater, solar still, and explained how each worked.

Following this visit, the children began the task of peeling their apples. They had previously decided to make applesauce and dry apples. These two projects were within the range of the facilities of the classroom. (Namely, cold water and an electric hot plate.)

One group carefully stirred their applesauce, while another group began the task of getting their apple slices dried.

At the end of cooking the applesauce, the group found that apples alone were a mite tarte. They then had to compute the cost of adding sugar and cinnamon. Adding to this was the task of figuring out how much electricity it had taken to cook the apples and computing the cost of it.

To complete the consumer education part of this task the entire class made a trip to the nearby Furr's Supermarket. Here they purchased one can of each of the available brands of applesauce. They taste tested each brand and decided one brand with some cinnamon added was comparable to their own. Then they computed the cost of an equal amount of their "homemade" applesauce. They were delighted to find out how much could be saved by doing it themselves. However, they remarked that it was quite a task to peel and prepare the apples, especially those from our local trees.

They also had to compute the cost of using a refrigerator or freezer to store their applesauce. The needed to learn that there is a cost to all electrical appliances.

Another group used a borrowed electric dehydrator. They were delighted to find in the dehydrator, a list of all the foods which could be dried, some simple directions for preparing them and the amount of time for each. They decided to xerox a copy of these directions for each student.

The final group set about the task of drying their apples outside the classroom windows. They set up two card tables and covered them with wax paper. The first day was nice and sunny. They were dismayed to see flies and bees on their apple slices, and decided one should cover them. They located some cheesecloth to lay over the apples. In the afternoon they carried the tables back into the classroom. The next day clouds developed and by mid-day it began to rain. The group hastily brought their tables of apples back into the room. The next day was also rainy. The group discussed that outdoor drying took a lot of time and work, and that the weather had to be monitered.

The fourth day dawned bright and clear so out went the tables again. However, in the late morning it became quite windy and before the apples could be rescued, they had been dusted down.

The class computed the cost of using an electric dehydrator (and it's initial cost) as apposed to a solar dryer (and its construction costs) and just using a table. They concluded that a solar dryer which would last for many years and would prevent foods from having dust and bug problems would be the way to go. In fact, they disliked the gritty taste of their table dried apples.

During each step of the project, the class made entries into their logs. One child also made entries into a master log which belonged to me, the classroom teacher.

This project was a good way to promote meaningful reading (direction, labels, etc.) at a variety of levels.

It provided math experiences; the children had to compute the costs of using electrical appliances (which many had here to fore thought was free). Comparing the various alternatives of preservation was a real practical way of tackling Consumer Education at the 5th grade level.

The class discussed several different times that starting from scratch was fun, but took a lot of time and effort (people energy). They decided that if one worked, one might want or need to buy time from an electric slave (appliance) or a factory (store-food).

Keeping an individual log was a painless way to encourage creative writing (and believe me some of the spelling and grammar was creative). The children were encouraged to use their dictionaries for spelling (but few did). The master copy was corrected, however. (It is my personal philosophy that until a child is well grounded in the task and joy of writing, that too much adult intervention (correction) is a turn-off and counter-productive, so I leave this for some secondary teacher to remedy.

This project attempted to teach the children to utilize the things which they have, namely free apples, and not to waste these resources.

This project introduced some of my boys (and my girls) to the fun of simple cooking This lack of cooking experience was a surprise to me considering their age.

Were I to do this project again (and I no doubt will as it is quite a practical one for our area) I would try to build a solar crop dryer to use. However, this class was too restless for such a project and my personal budget couldn't afford it.

This project was so open-ended that it adapts to a wide range of student abilities. It could even be used in a city setting where one needed to purchase the fruit involved. One could add the canning and freezing process as well as more sophisticated foods such as pies, dumplings, cakes, etc. This would increase the reading and math skills involved. There are doubtless other additions which could be made to accomodate the needs of varied groups.

Impact:

1. student comments
   "you left the lights on, etc"
2. students awareness of lights, heat, school building construction, etc.
3. sense of pride - accomplishment
   bulletin boards
   booklets
   posters
   plays
   video tapes
4. alteration of habits
   turning out lights
   recycling - cans
5. modeling behavior
   other classes began to ollow

6. home was made aware of energy conservation

   projects went home

   P.N.M. stickers went home

7. presented school energy survey results to the School Board

   increased writing and reasoning skills plus speaking skills

8. parent involvement

   field trips

   projects involvement the home

9. community involvement

   interviews with senior citizens, grandparents, etc.

   field trips

Recommendations:

1. Visit other Classrooms
2. Have a Show and Tell Workshop
3. Use Community Resources

   use yellow pages for businesses

   visiting scientists (N.M.H.U. or colleges)

   free films

   P.N.M. or local utility company

   Scouts

   Chamber of Commerce

   State Agency

   Federal Agencies

   A.A.A.

   parents

   school or public library or media center

4. Gear projects to age level of children
5. Tie energy to as many curriculum areas as possible
6. Try to involve parents in the project
7. Try to get an audience beyond the classroom
   - pictures in newspapers
   - parent or school presentations
   - display or bulletin boards
8. Team up with another teacher or class
9. Involve students in all phases
   - planning
   - carry-out
   - evaluation

SECONDARY

HOME ECONOMICS

MARTHA WHEELER - CLOVIS, NEW MEXICO

ANGELINA R. VALDEZ - ESPANOLA VALLEY HIGH SCHOOL - ESPANOLA, NEW MEXICO

GEORGANN SEIBERT - PUBLIC SERVICE COMPANY OF NEW MEXICO - ALBUQUERQUE, NEW MEXICO

HOME ECONOMICS

Martha Wheeler
Clovis, NM

The students in the classes were from moderately affluent homes, having grown up with little regard for energy costs and little or no concern for diminishing energy supplies. Students were about half and half boys and girls, and Anglos and Hispanics.

In the grain production economy of Curry County, rising irrigation fuel costs are so great that rising home energy and transportation costs seem small by comparison.

Selected items from activities that were used:

1. Attitude Survey and Summary Tabulation
2. Solar History Overview and Time Line
3. Living with Alternative Energy - Situation Role-Playing of Case Studies
4. "To Catch a Sunbeam" - a Game for Young Children
5. Test - Solar Energy Unit
6. Attitude Survey - Past and Comparison Summary
7. Other or Miscellaneous Activities

ENERGY ATTITUDE SURVEY

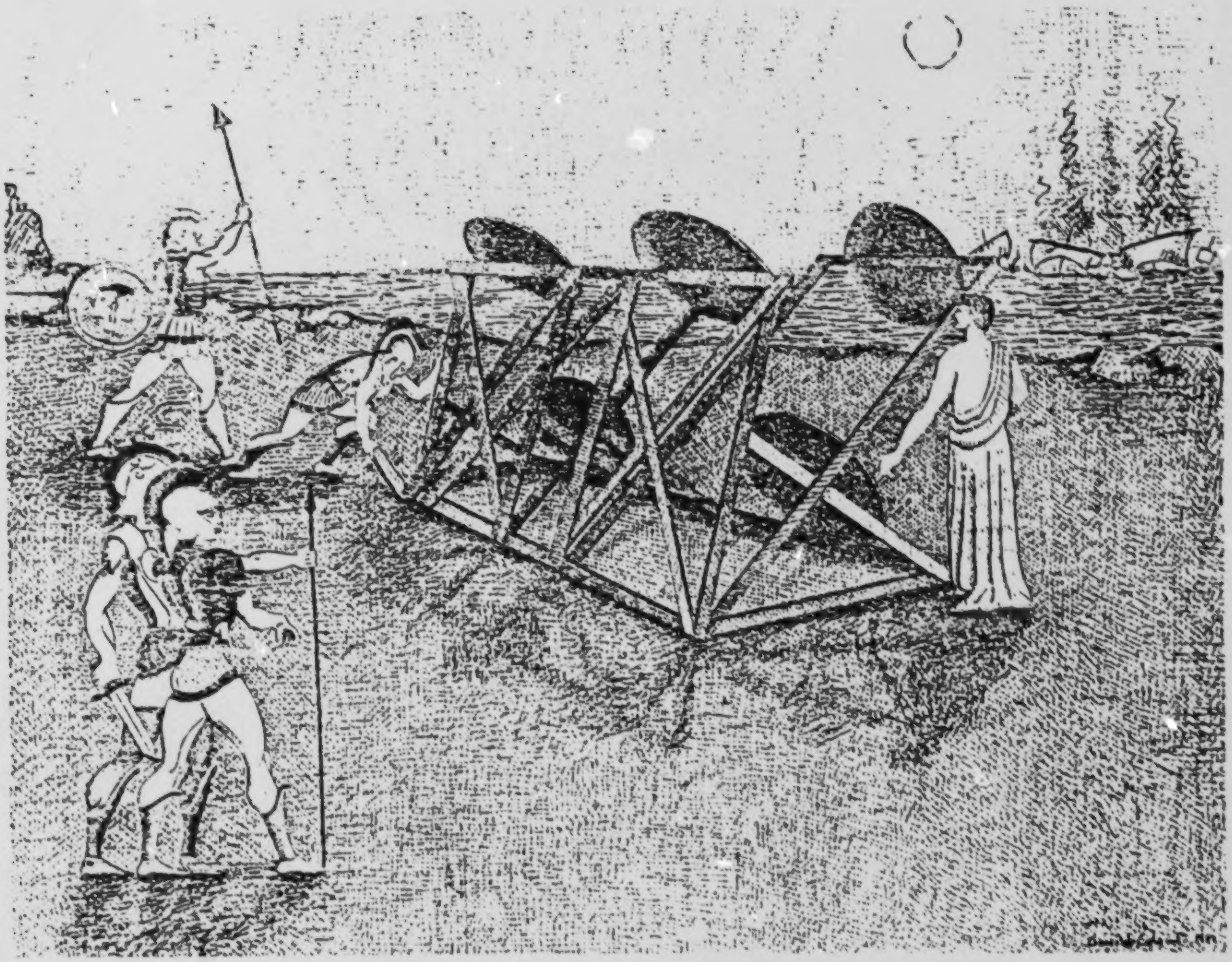
1. Do you believe there is an energy shortage? ___yes ___no ___don't know
2. Do you believe you have been given a realistic picture of the energy situation facing the United States? ___yes ___no ___don't know
3. Do you believe most Americans are energy "wasters"? ___yes ___no ___don't know
4. Do you believe most Americans are energy "conservers"? ___yes ___no ___don't know
5. Do you believe Americans are "spoiled," self-indulgent and reluctant to take responsibility for the future? ___yes ___no ___don't know
6. Do you believe it is the responsibility of every U.S. citizen to conserve energy voluntarily? ___yes ___no ___don't know
7. Do you believe Americans will conserve energy only when government controls are imposed? ___yes ___no ___don't know
8. Do you believe energy conservation always means doing without? ___yes ___no ___don't know
9. Would you be willing to reduce your standard of living to conserve energy? ___yes ___no ___don't know
10. Do you believe you as an individual can make an impact on energy consumption? ___yes ___no ___don't know
11. Would you conserve energy to save money? ___yes ___no ___don't know
12. Do you think the money saved is worth the inconvenience of conserving energy? ___yes ___no ___don't know
13. Do you think the energy saved is worth the inconvenience of conserving energy? ___yes ___no ___don't know
14. Do you feel technology will "bail us out" of the energy shortage? ___yes ___no ___don't know
15. Do you feel you have any input or participation in the energy usage decisions made by your family? ___yes ___no ___don't know

16. Are you going to do something to save energy? ___yes ___no ___don't know

DRAFT

2

A Short Solar History



Introduction

Imagine yourself living a long time ago. If you had happened to discover a new way to use solar energy, how would it have changed the home you lived in, the foods you ate, or the clothing you wore?

This activity will give you a chance to look into the past to find out how solar energy affected the lives of people. You will also look at how solar energy is used today, as people again look to the sun as a source of energy. Future advances in solar energy will be very important; they may even determine the career you pursue or the home you live in.

Objectives

At the completion of this activity, you should be able to

- construct a time line to express visually the advances in solar energy use throughout recorded history,
- recall examples of how solar energy was used to provide a more comfortable life for families,
- recall examples of how solar energy was used to do work, and
- determine ways solar energy is being used today.

Skills and Knowledge You Need

Constructing a time line

Understanding time in terms of centuries

Materials and Equipment

a roll of paper

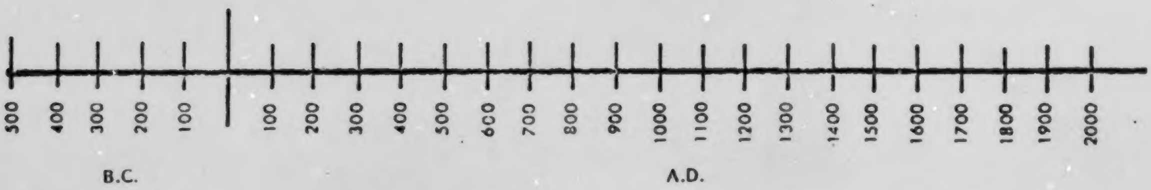
markers or crayons

a meter stick

Procedure

1. Prepare a solar history time line in 100 year intervals, from 500 BC to 2000 AD, as follows.
    a. Using a long roll of paper, brightly-colored markers, and a meter stick, mark off 26 equal divisions as shown. Leave enough space between each division to write information about solar energy.

Diagram Time Line


500
400
300
200
100
100
200
300
400
500
600
700
800
900
1000
1100
1200
1300
1400
1500
1600
1700
1800
1900
2000
B.C.
A.D.

    b. Beside each division, write the year number as shown in the diagram.
    c. Mark the present year with a brightly-colored star.

2. Using the worksheet "A Brief Look at Solar History", select advances in solar energy use and write them in the appropriate place on the time line.

3. Hang your time line in a visible location in your school, where many people will be able to learn about solar energy.

4. As you study solar energy, add new information to the time line. Be sure to include advances in solar energy use that are occurring this year and those which are planned for the future.

Questions

1. From the worksheet, select one advance in solar energy use. Think about the changes that occurred as a result of that advance. If you had been living then, how might the advance have affected your home or the way you lived?

2. In what ways has the sun's energy been used throughout human history to provide more comfortable shelter?

3. What forms of solar energy technology listed on the time line are still in use today?

4. During which 100-year interval was the largest number of advances in solar energy made?

5. Which of the solar energy advances do you think are the most important? Why?

Looking Back

Looking back through recorded history, we have found many ways in which people used solar energy. While some people used solar energy to make their work easier for them, others used it to provide more comfortable shelter.

If it were possible to look ahead 25 or 50 years, you would probably be surprised at the many new advances in solar technology. What effect do you think these advances will have on your life?

Going Further

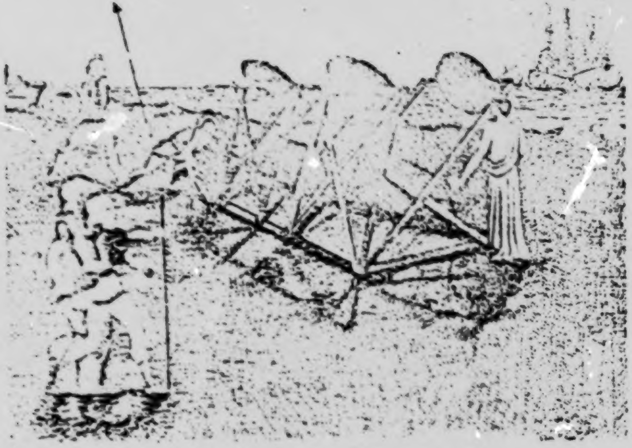
Prepare a time line to be displayed in your community, for example, in a bank or post office lobby.

On a wall chart, make two lists.

a. ways solar energy is already used in the school and at home, and

b. suggestions for utilizing solar energy in new ways at home and at school.

Using brightly-colored string and poster paper, make a large-scale time line for your school hallway. One meter, for example, could equal 100 years. Decorate your time line with photographs and/or drawings of solar energy use.



Archimedes' Legendary Burning of Enemy Ships

500 B.C.

The Greeks used sundials to chart the sun's daily and seasonal course. Homes were built to maximize the entrance of the winter sun into the main rooms and to shelter them from the cold north winds; overhanging roofs were used to shade homes from the summer sun.

300 - 200 B.C.

The Greeks described the use of "burning mirrors" -- solar reflectors of curved, polished metal used to concentrate the sun's rays in order to ignite fires. According to legend, Archimedes used "burning mirrors" to set fire to enemy ships.

The Chinese used burning mirrors for religious purposes.

100 B.C.

The Romans invented the use of transparent (rather than colored) glass for windows. Transparent windows admit sunlight to a room and also trap heat inside. Solar greenhouses produced fruits and vegetables year-round. Solar energy helped heat public baths.

1st - 6th Century A.D.

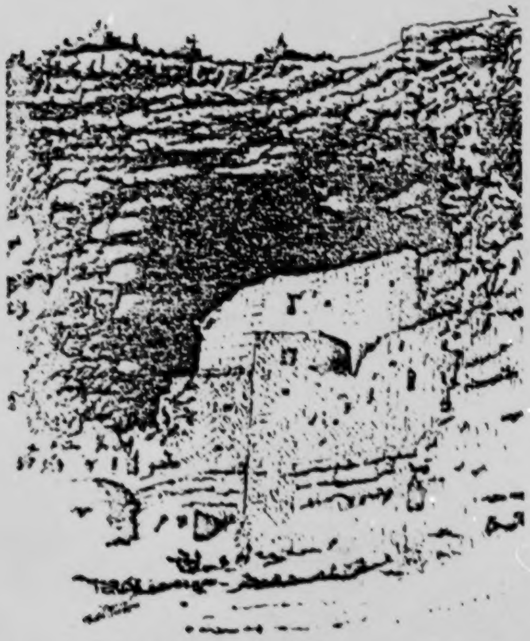
Wood became scarce in the Roman empire. The use of solar energy to heat residences and greenhouses was widespread. The first laws were written establishing the right of access to sunshine.

1100 - 1200 A.D.

The Pueblo Indians in southwestern North America built homes facing south, with thick adobe walls to absorb heat and to moderate temperature fluctuations.

1500's

Alchemists used solar energy to make perfume by placing flowers in water-filled containers. The heat from a focused mirror caused the scent of the flowers to diffuse into the water.



Early Cliff Dwellings From the American Southwest

1515 A.D.

Leonardo Da Vinci planned and began work on a 4-mile wide mirror intended to generate heat and power for industrial use.

Early 1600's

Salomon de Caus, a French engineer, used the concentrated rays of the sun to operate a small water pump, one of the first solar energy machines.

Athanasius Kircher, a German writer, described the first solar furnace, in which focused solar rays were used to purify water.

Late 1600's

Brick fruit walls were designed by the French and English. Fruit ripened faster when fruit trees were grown against walls which retained the sun's heat.

1700's

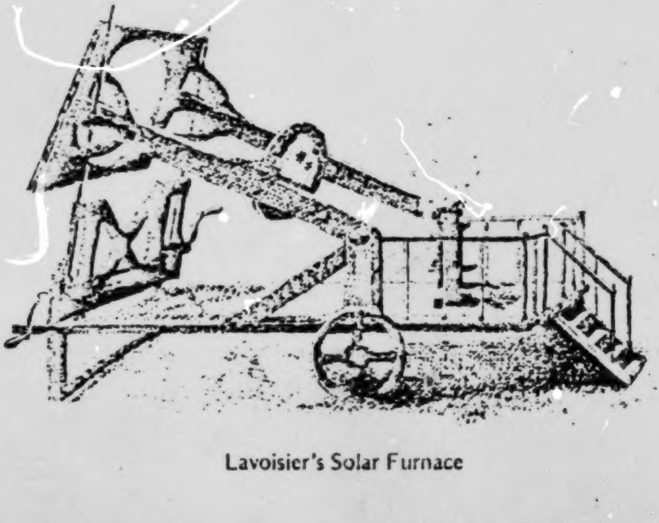
Colonial architects built "saltbox" homes in New England. At the front, two stories faced south to admit the sun; only one story faced north at the rear. The sloped roof in the rear swept winter winds over the house.

1767 A.D.

Horace De Saussure built the first hot box, the forerunner of modern solar collectors. This box could reach temperatures above the boiling point of water.

1774 A.D.

Joseph Priestly discovered oxygen by heating mercury oxide with a burning glass.



Lavoisier's Solar Furnace

Late 1700's

Antoine Lavoisier, the "Father of Chemistry", built a large solar furnace which could reach temperatures of 1000°C.

1800's

Glass-walled conservatories for displaying plants became popular in the homes of wealthy Europeans; they also served to warm adjoining rooms.

1839 A.D.

Edmund Becquerel, a French physicist, discovered that sunlight could produce electricity (photovoltaic effect).

Mid 1800's

Augustin Mouchot, a French solar pioneer, combined the concepts of solar reflectors and hot boxes and invented a solar oven, a solar still, and a solar pump. In 1866 he developed the first solar-driven steam engine.

1870's

John Ericsson, an American engineer, developed a solar hot-air engine and an inexpensive way to make solar reflectors.

Charles Tellier, a French experimenter, invented what we now call the "flat-plate" collector.

1871 A.D.

A large solar water distilling plant was built in Chile by an American, Charles Wilson. The still produced 6000 gallons of fresh water a day and operated for 40 years.

1878 A.D.

A solar steam engine operated a printing press at the World Exposition in Paris. It was one of the hits of the show.

1880's

Charles Fritts, an American inventor, made the first solar cells. Sunlight striking the cells produced electric current.

1891 A.D.

The first commercial solar water heater was developed. Called the "Climax", it combined a metal tank with a "hot box".

1904 A.D.

The first full-sized solar power plant was built in St. Louis.

1910 A.D.

William Atkinson, a Boston architect, used "sun boxes" oriented in different directions to prove his theory that the greatest benefit from the sun is gained through south-facing windows. He also convinced the Boston City Council to restrict the height of new buildings in order to guarantee access to the sun.

1912 A.D.

Frank Shuman, an American, built a large-scale solar plant to produce irrigation water in Egypt.

1920's and 30's

Solar water heaters were commonly used on homes in the southern and western United States.

1938 A.D.

Massachusetts Institute of Technology began building and doing research on solar homes. The principle factors affecting solar collector performance were investigated.

1940's

Maria Telkes designed solar still "survival kits" used by the U.S. Navy in World War II.

1954 A.D.

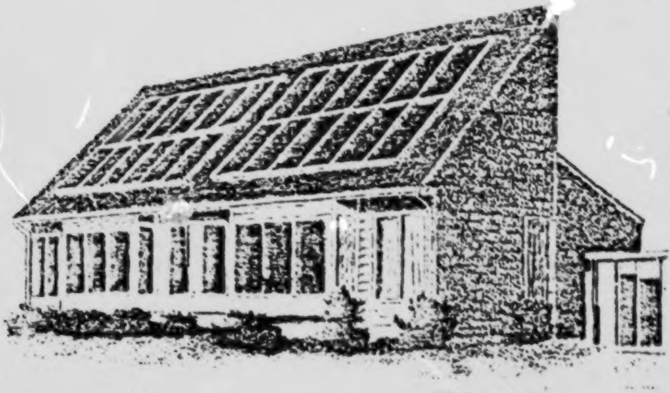
Silicon photovoltaic cells were developed by Bell Labs.

1950's and 1960's

NASA used solar cells, which are durable and lightweight, to power American space satellites.

1970's

Because of fuel shortages and increasing costs, there was renewed interest in solar dwellings. Research continued on active and passive solar homes and many people were building them.



Solar One, University of Delaware

Teacher Information

A Short Solar History

Suggested Grade Level and Skill Area

7- 8 Home Economics
Housing
Family Life
Future Homemakers of America

Skill Objectives

Using a meter stick to make a time line

Listing on the time line historical advances in solar energy uses

Observing forms of solar technology being used today

Content Objectives

Throughout human history, the sun has been used as a source of energy.

Many advances in the use of solar energy have been made since the beginning of recorded history.

Many of these advances have served to provide more comfortable shelter.

Most of the advances in solar technology were forgotten during the "cheap energy" era. With today's inflation of fuel costs, there is renewed interest in solar energy.

Background

Solar energy has been used throughout human history to provide more comfortable shelter for families. Since the 1500's, solar energy has been a source of energy for doing work. It has been employed in many countries and by many cultures.

In this activity the student will become aware of a number of the varied ways solar energy has been used in the past. The time line will visually illustrate to the student the many advances made in solar energy use over time.

Advance Planning

Reproduce the worksheets before the class meets.

Collect materials needed to make the time line.

Suggested Time Allotment

One to two class periods

Suggested Approach

This activity will fit well into units or courses in housing, consumer education, family life, and culture.

As an introduction to the activity, define solar energy and alternative energy. Provoke students into thinking about the effects of the sun's energy on them as individuals. How have they experienced the sun's energy? How have they used it? Examples can include acquiring a tan, using a beach umbrella for a sun shade, using glassed-in bus shelters, feeling the effects of the sun when walking in a protected area.

Students can be assigned to work individually on a particular period of one large time line or small groups of students may each develop a complete time line.

Discuss the "Going Further" suggestions. These may be done as an optional assignment or outside activity.

Precautions

Obtain permission from your principal or from community officials before displaying the time line.

Points for Discussion

Where would you prefer to sit in the house or in the classroom when it is very cold or very hot outside?

In what ways could you use solar energy in your classroom or house?

In what ways have you used energy from the sun when hiking, skiing, or camping ?

The first public baths were cavelike, but later they were very open with large expanses of glass. What are the advantages of each kind of bath?

It has been predicted that solar energy will become the source of at least 20% of our energy by the year 2000. Do you think this is a possibility? In what ways do you think solar energy will be used in the future?

Typical Results

The time line should emphasize the many forms of solar energy that have been utilized throughout the course of recorded history. It should stimulate discussion among observers.

Evaluation

The time line should be neat and accurate.

Students should participate in discussion of the activity.

Students should be able to list examples of solar energy advances.

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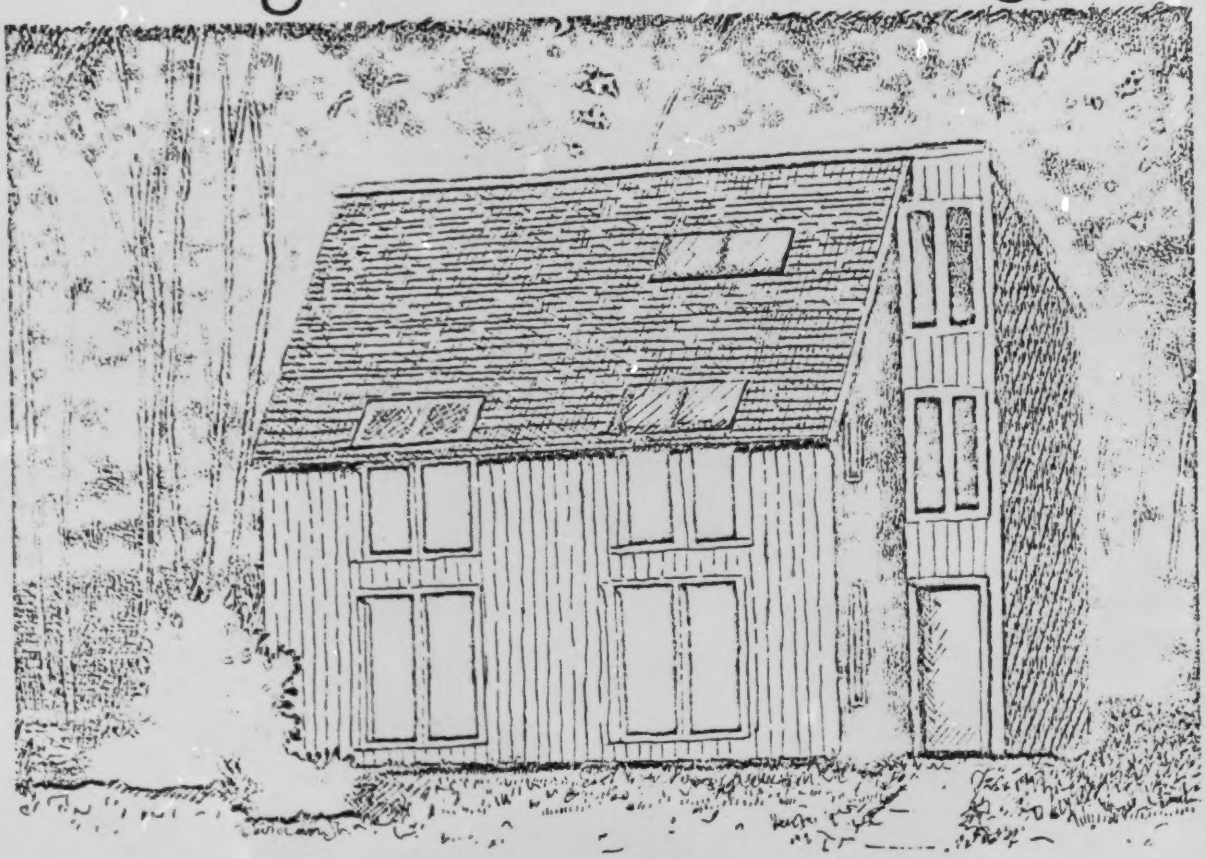
Living with Alternative Energy



Introduction

Have you ever thought about what it would be like to live in a house that was heated or cooled by solar energy? How would your life be different if your family decided to heat your home primarily with wood? Using alternative sources of energy in your home would cause some changes in the way your family lives. These changes are often called changes in lifestyle.

In this activity you will read about families which have different energy-consuming lifestyles. As you read each case study, think about the type of energy the family is using. Is it a renewable or nonrenewable energy resource? How has it changed the family's lifestyle? Perhaps you can imagine what it would be like for your family to live in each of the houses described in the case studies.

Objectives

At the completion of this activity, you should be able to

- identify the kinds of energy used to heat homes,
- determine whether each kind of energy is a renewable or nonrenewable resource,
- analyze the changes in lifestyle that each kind of energy use would require, and
- recognize the commitment needed to live in a house heated with an alternative source of energy.

Skills and Knowledge You Need

The skill of reading and discussing a case study

The knowledge that caulking is a putty-like material used to seal joints or cracks around doors and windows

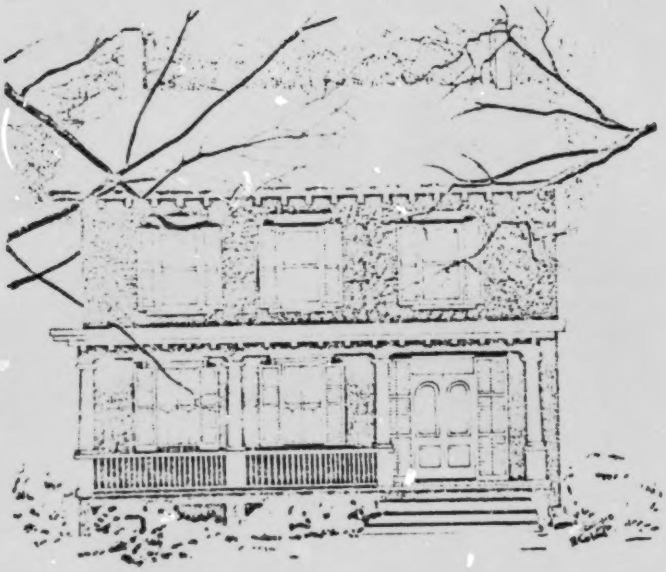
The knowledge that insulation is a material that slows heat loss from a home

Materials and Equipment

a notepad and pencil for recording

Procedure

1. The teacher or another student will divide your class into three groups.
2. Appoint one person to be the recorder of your group's discussion.
3. Read and discuss each case study.
4. Answer the questions in the question section.
5. When all three groups are finished, your class should reassemble and discuss the three different lifestyles presented.
   or role play a family situation involving the case study.



Case Study 1

The Warners moved from a large mid-western city to a small town in the country. Mr. Warner was transferred by his company to manage a factory located in the town. Mrs. Warner had worked as a technician in a medical office, but did not plan to begin work in the new location for several months, until the family was well settled. The Warners have three children of elementary school age.

The family found an older single-family dwelling in their new town. It was close to the school the children were attending and within walking distance of most community services.

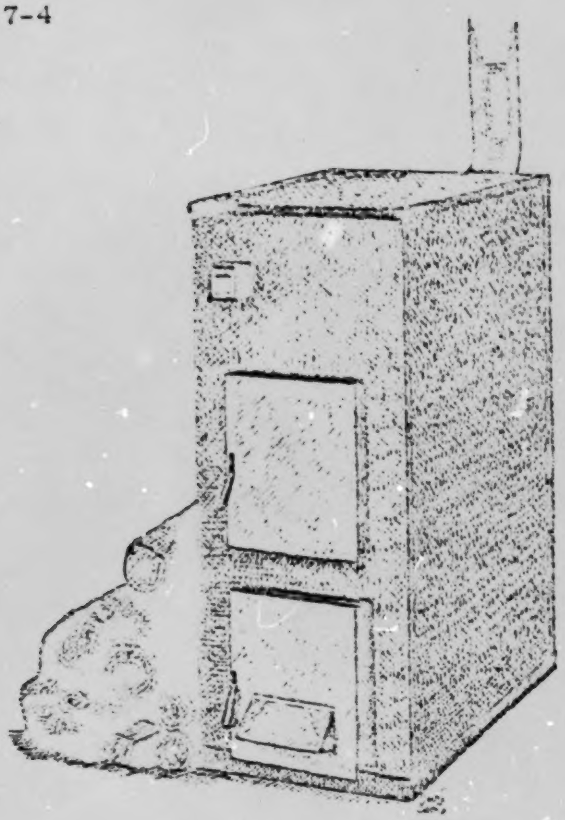
The home the Warners moved into was built in the late 1930's. It was a two-story home with a living room, dining room, kitchen, three bedrooms, and one and one half baths. One bedroom was on the first floor. The house was insulated with 3 inches of cellulose insulation in the ceiling and almost none in the side walls. All the windows and doors had wooden storm windows which were in need of caulking.

The elderly couple from whom the Warners bought the house indicated that the heating and hot water bills were not unreasonable for a house of that size. The heating system utilized a gas-fired furnace which had been converted from coal some years earlier. Water was also heated with natural gas.

The Warner family moved into the house at the end of the summer and adjusted well to their new home and community. As the weather became colder, the family noticed that the monthly heating bills were quite high. Mrs. Warner was home all day and consequently did most of the housework then. The children were in and out of the house frequently. The Warners' monthly bills were higher than they had expected and exceeded the amount they had originally budgeted for heating costs. The Warners had not realized that during the cold winter months the elderly couple had closed off the upstairs and conducted most of their daily activities on the first floor.

The Warners determined that the house needed more insulation, but this could not be installed until Mrs. Warner went to work and enough money for it could be saved. In the meantime, the family realized that its lifestyle would have to be adjusted.

7-4



Case Study 2

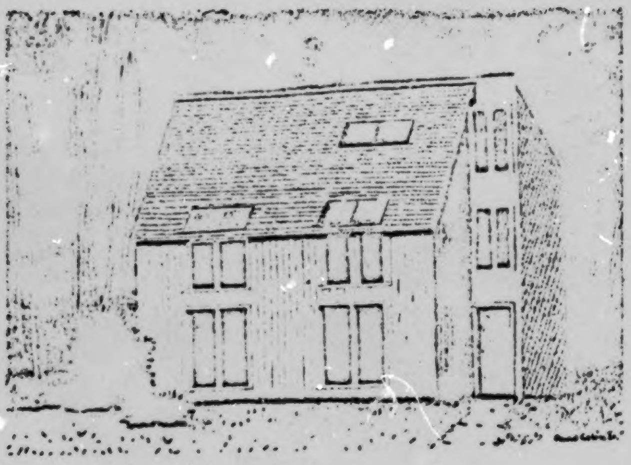
The Burns family lives five miles outside of a small northern city. Ten years ago they built a ranch home for their family of six on five acres of heavily wooded land. They have four sons: Robert, age 18; Kenneth, age 16; George, age 12; and Jonathan, age 9. Their home has been the source of much enjoyment for them. Both Mr. and Mrs. Burns work in the city. Mr. Burns works as a building inspector and Mrs. Burns works as a manager in a local department store.

For several winters the Burns had been keeping track of their energy costs. They had noticed a 68% increase in the price of fuel oil in four years. Fuel oil was used to heat their home as well as to heat hot water for the family all year long, and with four children the need for hot water was great! With their eldest son Robert contemplating college, Mr. and Mrs. Burns were concerned about the additional financial responsibility they would soon incur.

The family decided that one way in which they could save money and energy would be to install a wood furnace in the basement. The wood furnace could be hooked to their oil-fired furnace as an auxiliary source of heat for the house. Hot water for domestic use could also be heated by the wood furnace. The family realized that they had a source of wood right in their own backyard. Since Mr. Burns had indicated a desire to start a garden, the family cut the trees down in that section of the yard which was to be used for gardening.

The wood furnace was installed and the family worked together chopping and stacking wood. During the fall and winter, when heat was required, the family used the new wood furnace. It was necessary to feed the wood furnace three times per day: in the morning, after school, and in the evening before bed. After a period of adjustment, the Burns found their wood-heated home very comfortable and were content with their attempt to save money and conserve on the world's limited resources.

Case Study 3



The Rogers family, which consists of father, mother, and two children (Marci, age 13, and Melanie, age 9), realized that they had outgrown their small bungalow in a southwestern city. They looked at several larger homes for sale in their city, but decided that none of the homes they saw met their expectations. Because energy costs were rapidly increasing in their part of the country, they sought a home that was built with energy conservation in mind. The Rogers wanted a home which would be inexpensive both to heat in the winter and to cool in the summer.

After much thought, the Rogers decided that perhaps the only way they would get their energy-efficient home would be to build one. They looked at many house plans and finally decided to build a passive solar home. After consulting both an architect and an engineer about the plan, they found a general contractor who built the home for them.

The home was planned with floor-to-ceiling windows on the south side of the house and very few windows on the north side. The windows had shades which could be raised or lowered in order to control the entry of the sun's rays into the house. The interior of the home was open and had spaces which could be adapted to the activities of the family. This was in marked contrast to their former home, in which each individual room had a separate purpose.

While the home was being built, the Rogers planned the interior decoration and the landscaping. They considered such factors as the type of trees and shrubs which should be planted around the house and the type of furnishings which would absorb or reflect the sun's rays.

The Rogers excitedly moved into their energy-efficient passive solar home. After several months the family members sat down one evening to discuss life in their new home. They realized that their heating costs were quite low and that the house was exceptionally comfortable. One reason for this was that they had learned to manage the house efficiently. In discussing their current home maintenance activities, they commented on the ways in which their lifestyle had changed.

Questions

Case Study 1

1. In what ways could this family adjust its lifestyle to save energy?

2. What kind of energy is used to heat this house? Is this energy renewable or nonrenewable?

3. Considering the family's financial situation, what small structural changes, which would not be too costly, could be made to this home to make it more energy efficient?

4. What large structural changes would you suggest?

5. How will this family's energy needs change as the children get older?

6. In the future, what energy factors should this family consider when making a housing purchase?

Case Study 2

1. What changes in family lifestyle would occur as a result of heating a house with wood?

2. What heating costs did this family have after the wood furnace was installed?

3. What changes in responsibilities occurred when this family switched to wood heating?

4. What will happen when the family runs out of wood on its property?

5. Who will take care of the stove and the wood-cutting process when all of the boys have moved away from home?

6. What changes could the Burns make to the structure of their home to make it more energy efficient?

7. What kind of energy had the family been using before switching to wood?

8. What would happen if most families started using wood for home heating?

Case Study 3

1. What kinds of activities did the Rogers have to perform to manage their house efficiently?
2. What changes in lifestyle would be necessary as a result of living in a passive solar home?
3. What might have happened to the family's heating costs if the house hadn't been managed properly?
4. What energy resources did the Rogers save by living in a passive solar home?
5. What other resources did the Rogers use in order to conserve energy?

Looking Back

You have had the opportunity to look at three different methods of heating a home. Each method consumed different amounts and kinds of energy. Each method also required a different family lifestyle and varying degrees of commitment by family members in order to save energy. Family members sometimes had to substitute human energy and time to conserve nonrenewable energy resources. They learned the role cooperation between family members plays in reaching family goals. Perhaps you can think of ways your family can work together to conserve nonrenewable energy resources.

Going Further

Write a case study exploring how another family might conserve energy. Perhaps you may want to write about a family using an alternative form of energy. Have the class discuss your case study.

Go along with some people who are cutting wood for use in a wood-burning stove. Observe the work involved. Ask the people why they are heating with wood.

Go to a store that sells wood-burning stoves. Ask a salesperson to explain to you how the stoves work and how much wood they require. Besides the cost of the stove, what other costs would be incurred if you switched to wood heating?

Talk to an architect who builds solar homes. How has the architect taken into consideration the change in a family's lifestyle that would result from living in a solar home?

DRAFT

Catch a Sunbeam: A Game for Young Children

Introduction

Like adults, children too need to learn about how the sun affects their lives. In this activity you'll help young children understand how the sun aids in keeping them healthy. You'll also learn about one of the ways in which we teach young children.

Babies and young children need to develop strong bones and teeth. To do this, their bodies must produce Vitamin D, a substance which helps them to absorb and use the calcium and phosphorus contained in the foods they eat. One source of Vitamin D is sunlight. When the ultraviolet light in sunlight strikes us, a substance in our skin is changed to Vitamin D. No wonder Vitamin D is often called the "sunshine vitamin".

Objectives

At the completion of this activity, you should be able to

- o teach young children a game called "Catch a Sunbeam",
- o sew a bean bag to use in the game,
- o explain to young children how sunshine helps to keep the human body healthy,
- o state how the human body uses Vitamin D,
- o recognize that sunshine is a natural source of Vitamin D, and
- o identify Vitamin D-rich food.

Skills and Knowledge You Need

How to cut fabric

How to sew a running stitch

Materials and Equipment

2 8-inch squares of yellow felt

yellow thread

a sewing needle

scissors

dried peas, beans, lentils, or large bird seed

straight pins

magazines

cardboard or tagboard

Procedure

1. Cut out the paper pattern of the sun provided on the worksheet. Be sure to cut on the "cutting" line.

2. Place the two 8-inch squares of yellow felt together. Place the paper sun on top of the squares. At the tip of each ray of sunshine, pin the paper sun to both squares.

3. Cut out the two layers of felt by cutting around the paper pattern.

4. Mark the "sewing" line on the top piece of felt. Remove the paper sun by tearing it off. Leave the pins in place.

5. Thread a needle with yellow thread. Knot the end.

6. Sew around the sun on the "sewing" line, using a small running stitch and leaving a one-inch opening on one ray.

7. Fill the sun bean bag with dried peas, beans, lentils, or birdseed.

8. Finish sewing the last inch of the "sewing" line. Knot securely.

9. Obtain information on Vitamin D from your teacher. Cut pictures of Vitamin D-rich foods from magazines and mount them on cardboard or tagboard.

10. Sit in a circle with all the children around the outside and the "teacher" in the center. (The teacher may be any student in the class.) The teacher should hold up a flashcard with the term "Vitamin D" written on it and explain that when sunlight strikes our skin, Vitamin D is produced by our bodies. The teacher should then explain the function of Vitamin D.

11. Show examples and/or pictures of foods that contain Vitamin D. Most of the Vitamin D contained in these foods was produced when the foods were exposed to sunlight or ultraviolet light.

12. Tell the children to close their eyes and imagine that they are the "sun", sending rays out to all the other students. Ask them to explain how Vitamin D can keep our bodies healthy and to tell the sources of Vitamin D.

13. Have the children stand in a circle and listen to the directions for the game "Catch a Sunbeam". If possible stand outdoors in the sunshine or indoors near a window.

14. Choose one child to be the sun's messenger. The child should walk around the circle carrying the sun bean bag while the other children chant:

    "A sunbeam, a sunbeam,
    Who will catch the sunbeam?"

15. The messenger should drop the sunbeam behind any child in the circle.

16. That child should pick up the sun and try to tag the messenger before he or she runs around the circle and reaches the empty space.

17. If the messenger is tagged, he or she must take another turn. If the messenger safely returns to the space, then the child carrying the sun becomes the messenger and takes a turn.

18. The game should continue until each child has a turn.

Questions

1. What vitamin is made when sunlight touches the skin?

2. How is that vitamin produced?

3. Why is it necessary for babies and children to have the proper amounts of that vitamin?

4. What foods provide us with Vitamin D? How is Vitamin D produced in these foods?

5. Why is it a good idea to teach young children through games?

Looking Back

When people are exposed to the sun, a substance in their skin is changed to Vitamin D. When milk, grains, or even bread are exposed to ultraviolet light, similar substances are also converted to Vitamin D. When we artificially irradiate these foods with ultraviolet light, we are said to be "fortifying" them. These foods, as well as sunshine, are our best sources of Vitamin D. Vitamin D is especially important for building strong bones and teeth in young children.

Children learn through play. By playing a game in the sun, they have learned that their bodies need the sun's rays to stay healthy.

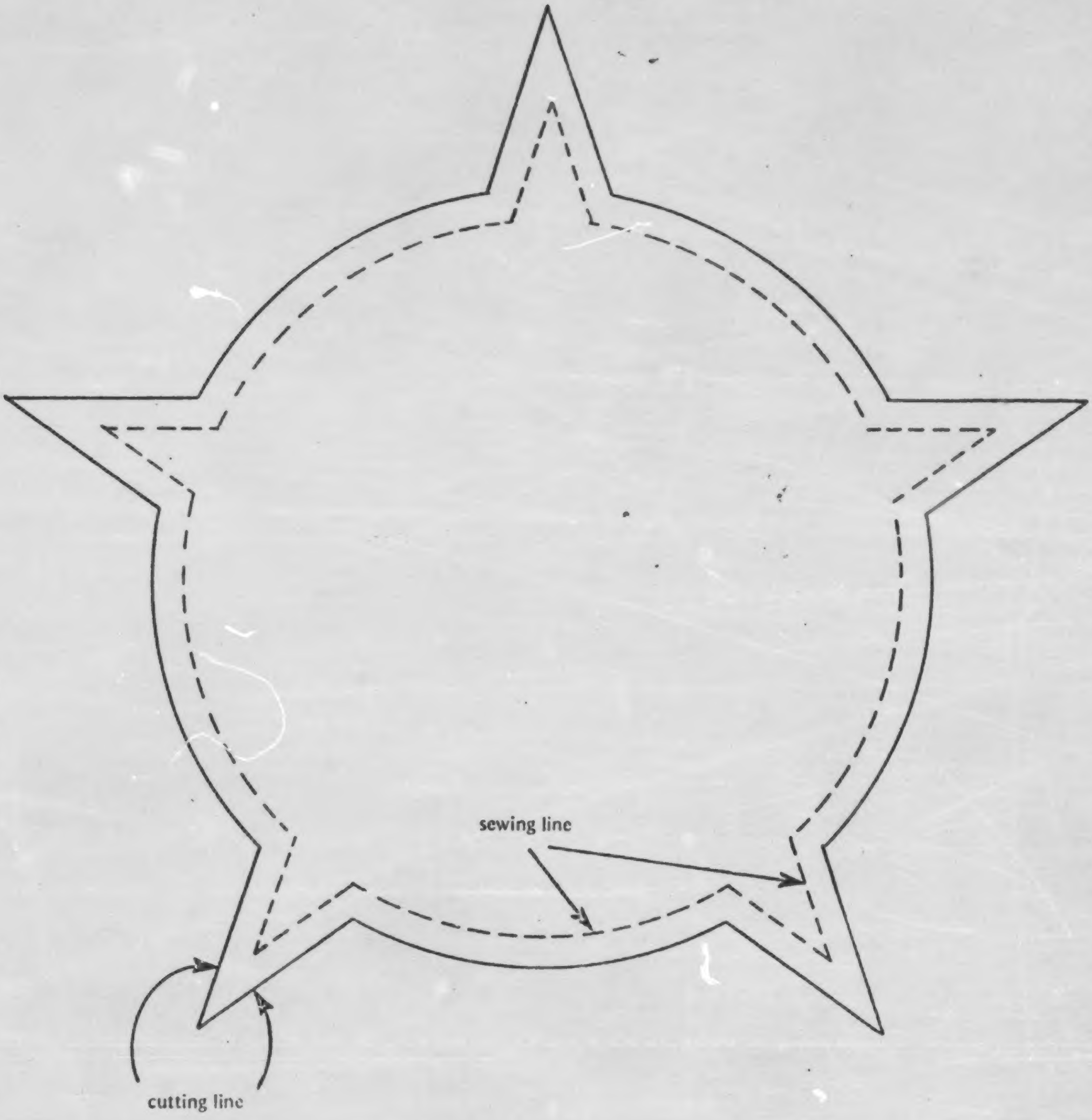
Going Further

Prepare a picnic or snack outside in the sun for the children. Choose a food or foods that are high in Vitamin D. Explain again how Vitamin D is produced.

As the children play "Catch a Sunbeam", have the messenger call out a food that is a source of Vitamin D as the sun bean bag is dropped behind a player.

Take a large sheet of heavy cardboard and draw a picture of a house on the surface so that the entire sheet becomes a house. Cut out the doors and windows. Prop the cardboard against a wall. Have the children toss the sun bean bags through the doors and windows to collect points. This game can be played individually or in teams, and is a good way for children to gain skill in accurate throwing. The game can then lead into a discussion on the way sunshine enters a house and the benefits of passive solar design for homes.

Worksheet
Making a Sun Beanbag


sewing line
cutting line

Teacher Information

Catch a Sunbeam : A Game for Young Children

Suggested Grade Level and Skill Area

5-7 home economics program in which students are working with young children

Future Homemakers of America

Skill Objectives

Pattern cutting

Fabric cutting following a pattern

Sewing fabrics together with a running stitch

Teaching young children through games

Content Objectives

Sunshine in the form of ultraviolet light is necessary for conversion of a substance in human skin to Vitamin D.

Vitamin D is necessary for building strong bones and teeth in young children. It allows the body to utilize calcium and phosphorus.

Natural foods contain little Vitamin D, but do contain substances which, when exposed to ultraviolet light, are converted to Vitamin D. When these foods are irradiated artificially to produce Vitamin D, they are said to be fortified.

Children learn readily through the use of games that also contain instruction.

Background

Vitamin D is available to the body through two separate processes. The first process occurs when human skin is exposed to sunshine. Human skin normally contains a fat-related compound known as cholesterol, which can be converted through a complex series of chemical reactions into dehydrocholesterol. This compound is converted to Vitamin D ($C_{27}H_{44}O$) when exposed to certain wavelengths of ultraviolet light (generally not those which cause sunburning). The most crucial factor in the production of Vitamin D is not the quantity of dehydrocholesterol in the skin but the availability of the wavelengths of ultraviolet which trigger the conversion process.

Rickets is a disease in which bones do not calcify normally and teeth develop poorly calcified enamel. This disease can be prevented by proper amounts of Vitamin D. Vitamin D allows the absorption into the bloodstream of the calcium and phosphorus contained in food and the reabsorption of phosphorus in the kidneys. Rickets is a disease of the temperate regions of the earth, where there is much cloudiness, fog, and air-borne dust to filter out the ultraviolet rays of the sun. Heavy clothing and window glass will also filter out ultraviolet, further reducing the natural production of Vitamin D by the skin. Fortunately, rickets is becoming a rare disease, because there is a second method of obtaining Vitamin D--observing a proper diet.

Common foods contain little Vitamin D. Plants and animals, when exposed to sunlight, can also produce Vitamin D, but the amount in any prepared food will vary with the food's exposure to sunlight. Saltwater fish contain large amounts of Vitamin D, as do the livers (which can store Vitamin D) of cod, halibut, and sharks. Thus the importance of the famous cod-liver oil. Today many common foods are fortified with Vitamin D, by either feeding the vitamin to the animals or irradiating milk or breads with ultraviolet radiation from arc lamps.

It should be noted that both methods of obtaining Vitamin D can be overdone. Excessive exposure to sunlight can cause skin cancers in some individuals, while overdoses of Vitamin D in foods can cause nausea, loss of appetite, and headaches, as well as a loss of calcium and phosphorus by the body.

Advance Planning

Purchase supplies for the sun bean bag ahead of time.

Gather magazines from which pictures of Vitamin D-rich foods can be cut (saltwater fish, fortified milk, and bread).

Suggested Time Allotment

One period to sew sun bean bags

One period to receive Vitamin D instruction and practice roles as teachers

One period to teach young children about Vitamin D and to play "Catch a Sunbeam" (15 minutes for teaching session and 20-30 minutes to play the game and provide summary for the lesson)

Suggested Approach

This activity provides an excellent opportunity for students to work with young children in a child development program. It also allows students a chance to prepare materials and perform as teachers in providing instruction to youngsters.

Perform this activity as a class project or as individual projects for interested class members. If older home economics students or FHA members are working with young children they may work on a one-to-one basis with the children, allowing them to help make the sun bean bag. In this case, the bean bag can be given to the child to take home.

Step 4 in the procedure requires students to mark a sewing line on the fabric. They may need instruction on how to do this.

Prepare the students well for their roles as teachers. Give them instruction on Vitamin D. Allow them time to prepare the flash cards and pictures of foods rich in Vitamin D. Have them practice what they will say and do before they teach the game to the children. Allow different students to perform different sections of the game part of the activity. Emphasize the importance of their teaching roles.

Precautions

If student supplies are not provided by the school, alternatives should be sought. Two suggestions would be to

sell the bean bags as a fund raising project (Christmas decorations, toys, paper weights, door holders, draft stoppers), or

ask a local charity group to supply materials, or have students collect odds and ends from home.

If the lesson is taught outside, prepare the children for the bright sunshine by explaining how strong the sun's rays can be and by suggesting the use of sunglasses.

As children run around the circle, be aware of hazards and hidden obstacles.

Points for Discussion

How does the body obtain Vitamin D during the winter or on cloudy days?

Do people with dark skin receive more or less Vitamin D from sunshine than people with light skin? Why?

What foods have you eaten this week that have provided you with Vitamin D?

What are the dangers of overexposure to sunlight or overdoses of Vitamin D?

Typical Results

The students will enjoy creating their sun bean bags, but younger students may have difficulty with motor coordination skills.

The young children will learn three or four sources of Vitamin D and will understand that it helps create strong bones and teeth.

The young children will enjoy playing the game "Catch a Sunbeam" and will understand that sunshine plays a major role in their health.

Evaluation

Observe the students as they make the sun bean bags. Check the final product for sewing skills.

Verbally quiz the young children on the sources and function of Vitamin D.

Analyze the students' cooperation, sharing techniques, and teaching skills when playing the game. Observe their interactions with the children.

Modifications

Students could allow the young children to sew the bean bags themselves, giving help as needed, or they could allow the young children to help them make the bean bags.

The children could search in magazines for their own pictures of the sources of Vitamin D.

References

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(Distributed by Charles Scribner's Sons, Book Warehouse, Vreeland Avenue, Totowa, NJ 07512.

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(The C. V. Mosby Co., 11830 Westline Industrial Drive, St. Louis, MO 63141, 1979, $18.95.)

TEST: SOLAR ENERGY UNIT

I. Match up:

A. alternate sources
B. appliance explosion
C. bar graph
D. case study
E. conserve
F. fossil fuels
G. insulation
H. solar energy
I. survey
J. time line

____ 1. a collecting of information.

____ 2. the chronological order of a series of events.

____ 3. a study of a person or persons in a certain situation.

____ 4. a visual depiction of some facts for the purpose of comparison, etc.

____ 5. gas, oil, coal.

____ 6. one of the reasons energy demand has increased in the last 20 years.

____ 7. to keep from being wasted.

____ 8. solar, wind, water, and wood.

____ 9. energy from the sun.

____ 10. a material that slows heat loss from a home or building.

II. MATCH UP:

____ 1. The highest use of energy in the home is for
A. cooking
B. lighting
C. space heating
D. air conditioning

____ 2. Earliest use of solar energy was by the Greeks who used
A. sundials
B. water distilling plants
C. hot boxes
D. burning mirrors

____ 3. Caulking is
A. asbestos used for insulation
B. a putty-like material used to seal cracks
C. fiber glass used to seal cracks
D. rubber stripping used to seal cracks

____ 4. Biomass is
A. wood used for heat or energy
B. coal burning for fuel
C. utilization of alternate forms of energy
D. using renewable sources for energy

____ 5. The percentage of energy used in the world that comes from fossil fuels is
A. 10%
B. 45%
C. 70%
D. 95%

____ 6. Nineteen percent of the energy used in the United States is used in
A. industry
B. transportation
C. irrigation
D. the home

____ 7. With only 6% of the world population, the United States uses what percent of the world's resource production?
A. 10%
B. 30%
C. 70%
D. 90%

____ 8. Renewable sources of energy are
A. sun and wind
B. petroleum and natural gas
C. soft and hard coal
D. butane and propane

____ 9. Non-renewable sources of energy are
A. solar energy
B. fossil fuels
C. sind and water
D. electricity

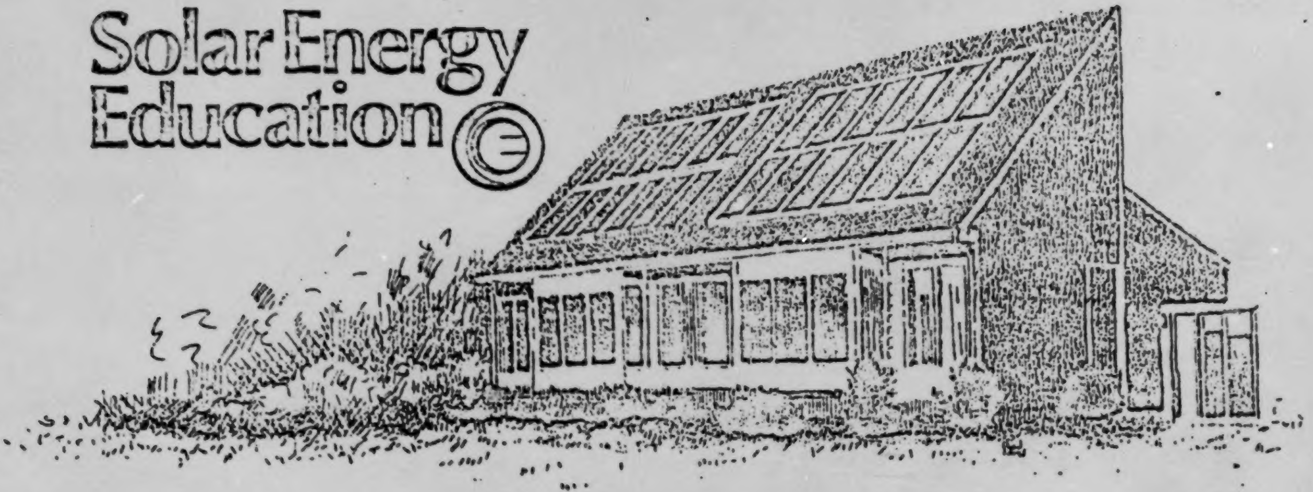
ENERGY ATTITUDE SURVEY

1. Do you believe there is an energy shortage? ___yes ___no ___don't know
2. Do you believe you have been given a realistic picture of the energy situation facing the United States? ___yes ___no ___don't know
3. Do you believe most Americans are energy "wasters"? ___yes ___no ___don't know
4. Do you believe most Americans are energy "conservers"? ___yes ___no ___don't know
5. Do you believe Americans are "spoiled," self-indulgent and reluctant to take responsibility for the future? ___yes ___no ___don't know
6. Do you believe it is the responsibility of every U.S. citizen to conserve energy voluntarily? ___yes ___no ___don't know
7. Do you believe Americans will conserve energy only when government controls are imposed? ___yes ___no ___don't know
8. Do you believe energy conservation always means doing without? ___yes ___no ___don't know
9. Would you be willing to reduce your standard of living to conserve energy? ___yes ___no ___don't know
10. Do you believe you as an individual can make an impact on energy consumption? ___yes ___no ___don't know
11. Would you conserve energy to save money? ___yes ___no ___don't know
12. Do you think the money saved is worth the inconvenience of conserving energy? ___yes ___no ___don't know
13. Do you think the energy saved is worth the inconvenience of conserving energy? ___yes ___no ___don't know
14. Do you feel technology will "bail us out" of the energy shortage? ___yes ___no ___don't know
15. Do you feel you have any input or participation in the energy usage decisions made by your family? ___yes ___no ___don't know

16. Are you going to do something to save energy? ___yes
___no ___don't know

WHAT?

Solar Energy
Education



STUDENT QUESTIONNAIRE

COURSE ______________________________ GRADE ____________

ACTIVITY NUMBER ___________ SEX M ____ F ____

ACTIVITY NAME ____

DIRECTIONS: Please circle the number which best indicates your answer to each question.

	YES	SOMEWHAT	NO
1. Do you like home economics?	1	2	3
2. Are you interested in solar energy?	1	2	3
3. Did you like working on this activity?	1	2	3
4. Was this activity interesting?	1	2	3
5. Was this activity easy to understand?	1	2	3
6. Was this activity easy to read?	1	2	3
7. Were the instructions easy to follow?	1	2	3
8. Did you like the pictures?	1	2	3
9. Were the diagrams helpful?	1	2	3
10. Did you have enough time to complete the activity?	1	2	3
11. Did you learn something new from the activity?	1	2	3
12. Is learning about solar, wood, and wind energy important?	1	2	3
13. Would you like to do more activities like this one?	1	2	3
14. Did you tell your parents about this activity?	1	2	3
15. Do your parents think learning about solar, wood, and wind energy is important?	1	2	3
16. How could this activity be made better?	1	2	3

____

Miscellaneous Activities:

1. Current events oral report to class - Students presented to the class a collection of newspaper items covering solar activities around the state.
2. Essay: "What have you learned about energy that will benefit you in the future?"

HOME ECONOMICS

Angelina R. Valdez
Espanola Valley High School
Espanola, NM

I teach Home Economics at Espanola Valley High School. Specifically, I teach Health Science and Human Relations courses and serve as chairperson of my department. Our enrollment is approximately 1725 students and many come from rural areas such as Abiquiu, 25 miles to the north, and Dixon, also 25 miles to the northeast. We also have two Indian pueblos, San Juan and Santa Clara. Our biggest ethnic group is of course, Hispanic. The Anglo and Indian populations are in the minority. In addition, we now have in our midst, some Moslems who have a mosque and the beginnings of a thriving community in Abiquiu.

My energy project involved the taking of an appliance survey (attached). The survey was completed by 25 students and an adult, usually a parent. The results were a little surprising to say the least. The students were surveyed on 121 appliances and the students had and used 1358 items whereas, their parents had used only 439 appliances when they were that age. The students realized that they were much too extravagent in their use of appliances and decided they would not have radios, stereos and television all going at the same time. We hope they became more concerned with energy needs for their children and grandchildren.

A follow-up activity evolved from this survey. The students researched energy-saving tips and compiled lists on Food Preparation with Minimum Energy and Tips on Saving Energy in the Home (attached).

My students were very enthusiastic about this project and I intend to include this activity this semester in my Human Relations classes. It will be interesting to see if there is any wide variation in these two comparative studies.

All materials to implement this activity are included and attached - i.e., the introduction, objectives, skills and knowledge needed, materials and equipment, procedure, the survey, questions, floor plan of a typical house and a graph.

[illegible]

Name ANGELINA F. VALDE

In Column 1, write the number of each kind of appliance you have in your home. Then have an adult fill in Column 2 for when he/she was your age. Total the number of appliances listed for each column.

	1	2		1	2
Air Conditioner, Central			Guitar, Electric		
Air Conditioner, Home Units			Hairbrush, Electric		
Automatic Bag Sealer, Elec.			Haircurlers, Elec.		
Automatic Egg Cooker			Hair Curling Iron, Elec.		
Automatic Timer, 24 hour			Hair Dryer, Blower		
Battery Charger, Elec.			Hamburger Maker, Elec.		
Baby Bottle Warmer			Heater, Room, Elec.		
Beanpot, Elec.			Heating Pad		
Blanket, Elec.			Hedge Trimmers, Elec.		
Blender			Hot Dog Cooker, Elec.		
Broiler, Elec., Portable			Hot Pot, Elec.		
Broom, Elec.			Humidifier		
Bun Warmer, Elec.			Ice Cream Maker, Elec.		
Calculator with Adaptor			Ice Crusher, Elec.		
Can Opener, Elec.			Intercom		
Coffeemaker, Elec.			Iron, Regular or Steam		
Comb, Elec.			Kiln, Ceramic, Elec.		
Cookie Maker, Elec.			Knife, Elec.		
Clock, Elec.			Knife, Sharpener, Elec.		
Crepe Maker			Lamps, Standard		
Defroster for Refrigerator			Lamps, Heat		
Dehumidifier			Lamp, Sun		
Dishwasher			Lawn Edger & Trimmer, Elec.		
Disposer, Food Waste			Lawnmower, Elec.		
Door Bell, Elec.			Lights, Indoor, Ceiling		
Doughnut Maker			Lights, Outdoor		
Drill, Elec.			Manicure Set, Elec.		
Dryer, Clothes, Elec./Gas			Massager, Elec.		
Fan, Elec.			Meat Grinder, Elec.		
Fingernail Buffer, Elec.			Mirror, Lighted, Make-up		
Floor Waxer			Mixer, Elec.		
Fondue Pot, Elec.			Organ, Elec.		
Food Dryer, Dehydrator, Elec.			Oven, Dutch, Elec.		
Food Processor			Oven, Microwave		
Food Slicer, Elec.			Oven, Portable		
Food Warmer Tray			Oven, Toaster		
Foot Whirlpool, Elec.			Peanut Butter Machine, El.		
Freezer, Independent Unit			Peeling Wand, Elec.		
Fryer, Deep Fat, Elec.			Pencil Sharpener, Elec.		
Frypan, Elec.			Pizza Maker, Elec.		
Furnace, Elec./Oil/Gas/Wood			Popcorn Popper, Elec.		
Garage Door, Elec.			Portable Buffet Range, El.		
Griddle, Elec.			Projector, Movie		
Grill, Outdoor, Elec./Gas			Projector, Slide		

Subtotal ______ ______

Subtotal ______ ______

ANGELINA R. VALDE

	1	2
Radio, Clock		
Radio, Standard		
Range, Kitchen, Elec./Gas		
Razor, Elec.		
Record Player		
Refrigerator, Elec/Gas		
Rotisserie, Elec/Gas		
Router, Elec. (tool)		
Rug Shampooer		
Sander, Elec.		
Saw, Elec.		
Scissors, Elec.		
Sewing Machine		
Shoe Polisher, Elec.		
Soldering Kit, Elec.		
Tape Recorder, Elec.		
Television		
Thermostat, Oil/Gas		
Toaster		
Toothbrush, Elec.		
Train Set, Elec.		
Typewriter, Elec.		
Vacuum, Cleaner		
Vaporizer		
Waffle Iron		
Washer, Clothes		
Water Heater, Elec./Oil/Gas		
Water Pik		
Whirlpool, Elec.		
Wok, Elec.		
Woodburning Set, Elec.		
Yogurt Maker, Elec.		
Other		
Subtotal		

Total Column 1 1,358

Total Column 2 439

Survey of 25 students

121 Items

ANGELINA R. VALDEZ

FOOD PREPARATION WITH MINIMUM ENERGY

ALSO

TIPS ON SAVING ENERGY IN THE HOME

AROUND THE HOUSE:

1. Turn off radios, stereos, lights when not in use.
2. Turn water heater thermostat to 120°; the water heater is one of the biggest energy guzzlers.
3. Take shorter showers and save on fuel and water; be conservative with water in the bathtub, too.
4. Wash clothes in cool water if that will do the job; there are cold-water detergents on the market.
5. Hang clothes outside whenever possible.
6. Walk to work, post-office, store whenever possible; drive to the store only once a week and you will save on money, too.
7. Keep house thermostat down to 68-70°; close off rooms that are not in use whenever possible.
8. Use low-wattage light bulbs where feasible - i.e. - hallways.
9. Close drapes at night and open during sunlight hours.
10. Wait for a full load before running the dishwasher, washing machine.
11. Close fireplace dampers when not in use.

AROUND THE KITCHEN:

1. Close refrigerator/freezer doors quickly; replace door seals when necessary.
2. Do you open the hot water tap and run water until you get hot water (for coffee or cereal in the morning, for instance), or do you draw cold water and turn on the stove? Both practices use about the same amount of energy. In the interest of saving water, start with cold water.
3. Dry fruits and vegetables in the summertime; save energy canning or freezing.
4. Keep freezer full if possible; a partially empty freezer uses more energy. (You can freeze water in coffee cans for mass and you will also have ice when you need it.)
5. Keep teakettles free of hard-mineral deposits; using equal parts of water and vinegar once a week will do the trick.
6. Warm up dinner plates in the oven if it is on, or place near a hot cooking utensil instead of plugging in a warming tray.
7. Do not use oven or burners to heat up the kitchen.
8. Cut food, meat and vegetables especially, for shorter cooking times.
9. Defrost frozen foods before cooking.
10. Self-defrosting refrigerators use more energy; so do ice cube makers.

ANGELINA R. VALDE.

AROUND THE KITCHEN: TOP OF STOVE MEALS

1. Plan one-pot meals that use only one surface unit (skillet).
2. Cook on top of wood stove if you are using one for alternate heat.
3. Bake on top of stove (cakes, muffins, biscuits).
4. Use flat-bottomed pans that have the most surface area in contact with the heat.
5. Match pan size to the size of the surface units so that heat is not wasted.
6. Use a small amount of water in vegetable cookery. The water will come to a boil faster; turn the heat down or off once the water is boiling. You will also be saving on vitamins and minerals by using less water and less heat.
7. Pots and pans with tight-fitting lids heat food more quickly.
8. A pressure cooker reduces cooking time and a whole meal can be cooked together.
9. Use copper cookware if you can afford it; it's a good conductor.

OVEN MEALS:

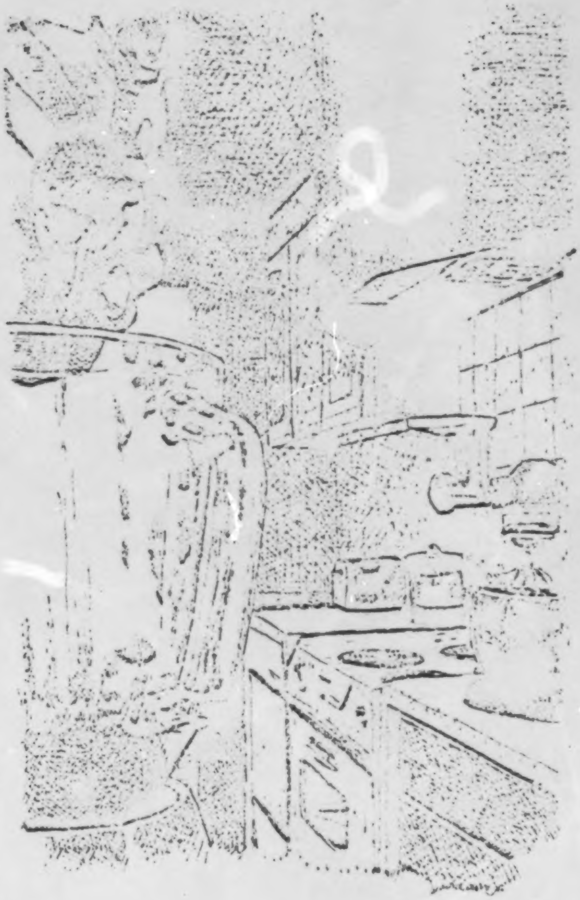
1. Plan meals that can be cooked at the same temperature at the same time.
2. If one food takes longer to cook, put it in the oven first, then add the others in order of cooking times.
3. Avoid using your oven for small amounts of food. Small appliances are more economical.
4. Use metal conductors to transfer heat to the center of a thick piece of meat or a potato. A stainless steel nail in a potato, a meat thermometer, or a skewer can perform this function.
5. Avoid foil wrappings in the oven because they lengthen cooking times.
6. Put food in the oven as soon as the oven is preheated (for baking) and remember to turn the oven off after use.
7. Resist the desire to peek into the oven to prevent heat loss.
8. If using more than one pan in the oven, stagger the pans so each has equal heat.

FIREPLACE MEALS:

1. When burning fireplace, cook dinner on a grill; or wrap food in foil and cook on embers.

DRAFT

The Appliance Explosion



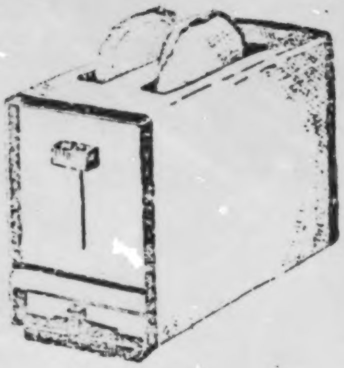
Introduction

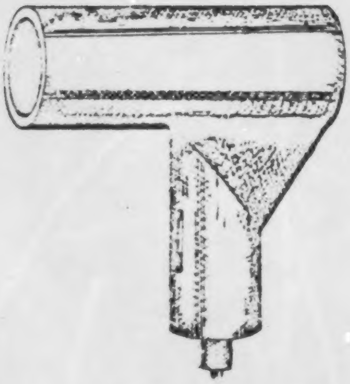
Approximately twenty percent of the energy used in the United States is consumed in the home. Energy is used in many ways: to heat, cool, and light your rooms; to heat water; to refrigerate and cook your food; to wash and dry your clothes; to entertain you; and to aid in personal care.

How many appliances do you have in your home? Can you even guess at the number? Do you know where the energy that runs these appliances originates?

Most of this energy comes from fossil fuels, either oil or natural gas, burned in your home by your furnace or hot water heater. The energy consumed in the home may also be produced from oil or coal burned at a power plant to produce electricity. In a few locations, energy may originate from hydropower or nuclear power plants that also produce electricity.

In this activity, you will discover the number and kinds of appliances you have in your home. You will compare this information with the appliances an adult had in his/her home a generation ago. Your results should help you understand the important role that energy plays in your life, and why energy demand has increased so much in the last twenty years.





Objectives

At the completion of this activity, you should be able to

- conduct a survey of appliance use,
- identify the appliances used in the home today and one generation ago,
- explain why the number of appliances used today differs greatly from the number used by adults when they were children,
- list appliances that could be eliminated from the home in an attempt to conserve energy, and
- construct a bar graph to show changes in appliance use over a period of time.

Skills and Knowledge You Need

How to do basic arithmetic

How to construct a bar graph

How to set up a display

Materials and Equipment

Home Appliance Survey

Typical House Floor Plan sheet

Construction paper and materials for an appliance use display

Home Appliance Use sheet

Procedure

1. Scan the list of appliances on the Home Appliance Survey. If you are not familiar with some of the appliances, consult your teacher or look them up in a store catalog.

2. Take the survey home. Under Column 1, record the number of each kind of appliance you have in your home.

   a. For example:

	1
Doughnut Maker	0
Radio, Clock	2

   b. Be sure to check for appliances in each room, in closets, and even areas outside the home, such as the patio or carport.

   c. Add any appliances not on the list to the blank space that is labeled "Other Appliances".

3. Now ask one of your parents or another adult to complete the survey.

   a. The adult should complete the survey in Column 2.

   b. The adult should complete the survey by listing the appliances found in his/her home when he/she was the age you are now.

   c. Record the year that the adult was your age.

4. Total the number of appliances in Column 1 and then in Column 2.

5. Using the Typical House Floor Plan sheet, place the name and number of each appliance you found in your home in the room where it was located. For example, on the floor plan of the kitchen area, write the words "refrigerator - 1".

6. Using a second floor plan sheet, ask the same adult to write the name and number of appliances he/she indicated on the survey in the room where the appliance would have been located.

7. Several students in the class should create a bulletin board for the classroom or display area. Some title suggestions are

   Appliances of Yesterday and Today

   Home Energy Use -- Past, Present, and Future?

   Conserve or Accumulate?

The bulletin board should have two large floor plans of a house like the smaller floor plans that students and adults have completed.

8. On one of the larger floor plans, students should record the kinds and numbers of appliances that were found in the students' homes during the survey. Each appliance should be listed in the room where it was located.

   For example:

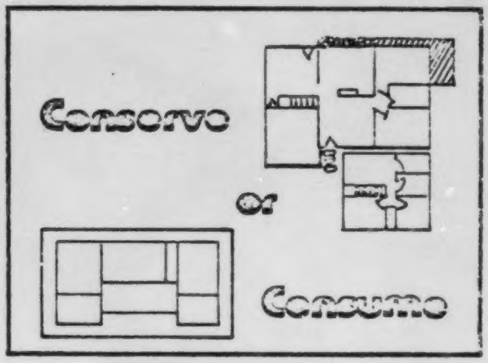
   On the kitchen area of the large floor plan, students should write

   Mixer, Electric 21

   to indicate that 21 students found an electric mixer in their kitchens.

Diagram 1

Sample Bulletin Board

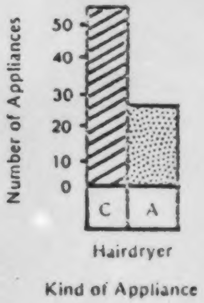


9. Using the second large floor plan, students should record the numbers and kinds of appliances listed by the adults who completed the appliance survey.

10. Using the results of Steps 8 and 9, complete the sheet on graphing home appliance use. Select 10 kinds of appliances to graph.

11. Construct a bar graph which compares the numbers of appliances for class members with the numbers of appliances owned by the adults at a corresponding age. Your bar graph might resemble this.

Diagram 2



Questions

1. How does the total number of appliances you use today differ from the number of appliances used by an adult when he/she was the age you are now?

2. Why do you think the numbers differ so greatly? What kinds of changes have taken place to make this possible?

3. Make a list of the appliances which you simply could not live without and another list of the ones which you feel you could eliminate from your home. Why did you decide the way you did?

4. Which appliances were found in the homes of today which were not in the homes of people one generation ago? How do you feel people managed without these appliances?

5. Solar energy is also a possible fuel source. Can you think of some ways solar energy could replace or reduce the fossil fuel energy used by appliances in your home?

Looking Back

Were you surprised by how many appliances your home has? When you compare this number with how many an adult had in his/her home a generation ago, it should help you understand how much the demand for energy has grown.

But the United States now faces a continuing "energy shortage". Perhaps you can begin to think of ways to conserve energy at home by reducing or eliminating nonessential appliance use.

Going Further

Trace appliance use back one more generation. Have a grandparent or older adult fill out the survey. Find the total number of appliances used. Compare this to your totals for a younger adult and for your own home. Tabulate class frequencies if data are available.

With your family's agreement, plan ways to reduce both the number of appliances and the length of time appliances are used. Then implement this plan from one utility meter reading to the next. Was your family able to reduce the amount of energy consumed?

Keep a daily log of the number of ways you use energy from the time you get up until the time you go to class. Can you reduce this energy use? How?

Research information on the new appliance labeling requirements for energy conservation. Visit an appliance store or invite a guest to speak on this topic.

Create a floor plan for the home of the future and in each room list the appliances you predict you will own twenty-five years from now. Do you notice any changes?

Invite other classes, parents, and friends to view the display and observe the types and numbers of appliances that were used in the homes of the students and adults who completed the survey. This display could be an FHA/HERO project for a local or district chapter.

Home Appliance Survey

Directions: In Column 1, write the number of each kind of appliance you have in your home. Then have an adult fill in Column 2 for when he/she was your age. Total the number of appliances listed for each column.

	1	2
Air Conditioner, Central		
Air Conditioner, Home Unit(s)		
Automatic Bag Sealer, Electric		
Automatic Egg Cooker		
Automatic Timer, 24 hour		
Battery Charger, Electric		
Baby Bottle Warmer		
Beanpot, Electric		
Blanket, Electric		
Blender		
Broiler, Electric, Portable		
Broom, Electric		
Bun Warmer, Electric		
Calculator with adaptor		
Can Opener, Electric		
Coffeemaker, Electric		
Comb, Electric		
Cookie Maker, Electric		
Clock, Electric		
Crepe Maker		
Defroster for Refrigerator		
Dehumidifier		
Dishwasher		
Disposer, Food Waste		
Door Bell, Electric		
Doughnut Maker		
Drill, Electric		
Dryer, Clothes (Electric/Gas)		
Fan, Electric		
Fingernail Buffer, Electric		
Floor Waxer		
Fondue Pot, Electric		
Food Dryer, Dehydrator		
Food Processor		
Food Slicer, Electric		
Food Warmer Tray		
Foot Whirlpool, Electric		
Freezer, Independent Unit		
Fryer, Deep Fat, Electric		
Frypan, Electric		
Furnace, (Electric/Oil/Gas/Wood)		
Garage Door, Electric		
Griddle, Electric		
Grill, Outdoor (Electric/Gas)		
Guitar, Electric		
Hairbrush, Electric		
Haircurlers, Electric		
Hair Curling Iron, Electric		
Hair Dryer, Standing/Portable/ Blower		
Hamburger Maker, Electric		
Heater, Room,Electric		
Heating Pad		
Hedge Trimmers, Electric		
Hot Dog Cooker, Electric		
Hot Pot, Electric		
Humidifier		
Ice Cream Maker, Electric		
Ice Crusher, Electric		
Intercom		
Iron, Regular or Steam		
Other ________________		
________________		
Subtotal		

	1	2
Kiln, Ceramic, Electric		
Knife, Electric		
Knife Sharpener, Electric		
Lamps, Standard		
Lamp, Heat		
Lamp, Sun		
Lawn Edger & Trimmer, Electric		
Lawnmower, Electric		
Lights, Indoor Night or Ceiling		
Lights, Outdoor Lawn		
Manicure Set, Electric		
Massager, Electric		
Meat Grinder, Electric		
Mirror, Lighted for Make-up		
Mixer, Electric		
Organ, Electric		
Oven, Dutch, Electric		
Oven, Microwave		
Oven, Portable		
Oven, Toaster		
Peanut Butter Machine, Electric		
Peeling Wand, Electric		
Pencil Sharpener, Electric		
Pizza Maker, Electric		
Popcorn Popper, Electric		
Portable Buffet Ranges, Electric		
Projector, Movie		
Projector, Slide		
Radio, Clock		
Radio, Standard		
Range, Kitchen, Electric/Gas		
Razor, Electric		
Record Player		
Refrigerator, Electric/Gas		
Rotisserie		
Router, Electric (Tool)		
Rug Shampooer		
Sander, Electric		
Saw, Electric		
Scissors, Electric		
Sewing Machine		
Shoe Polisher, Electric		
Slow Cooker, Electric		
Soldering Kit, Electric		
Tape Recorder, Electric		
Television		
Thermostat (Oil/Gas)		
Toaster		
Toothbrush, Electric		
Train Set, Electric		
Typewriter, Electric		
Vacuum Cleaner		
Vaporizer		
Waffle Iron		
Washer, Clothes		
Water Heater (Electric/Oil/Gas)		
Water Pik		
Whirlpool, Electric		
Wok, Electric		
Woodburning Set, Electric		
Yogurt Maker, Electric		
Other ________________		
________________		
Subtotal		

Total of Column 1 1358

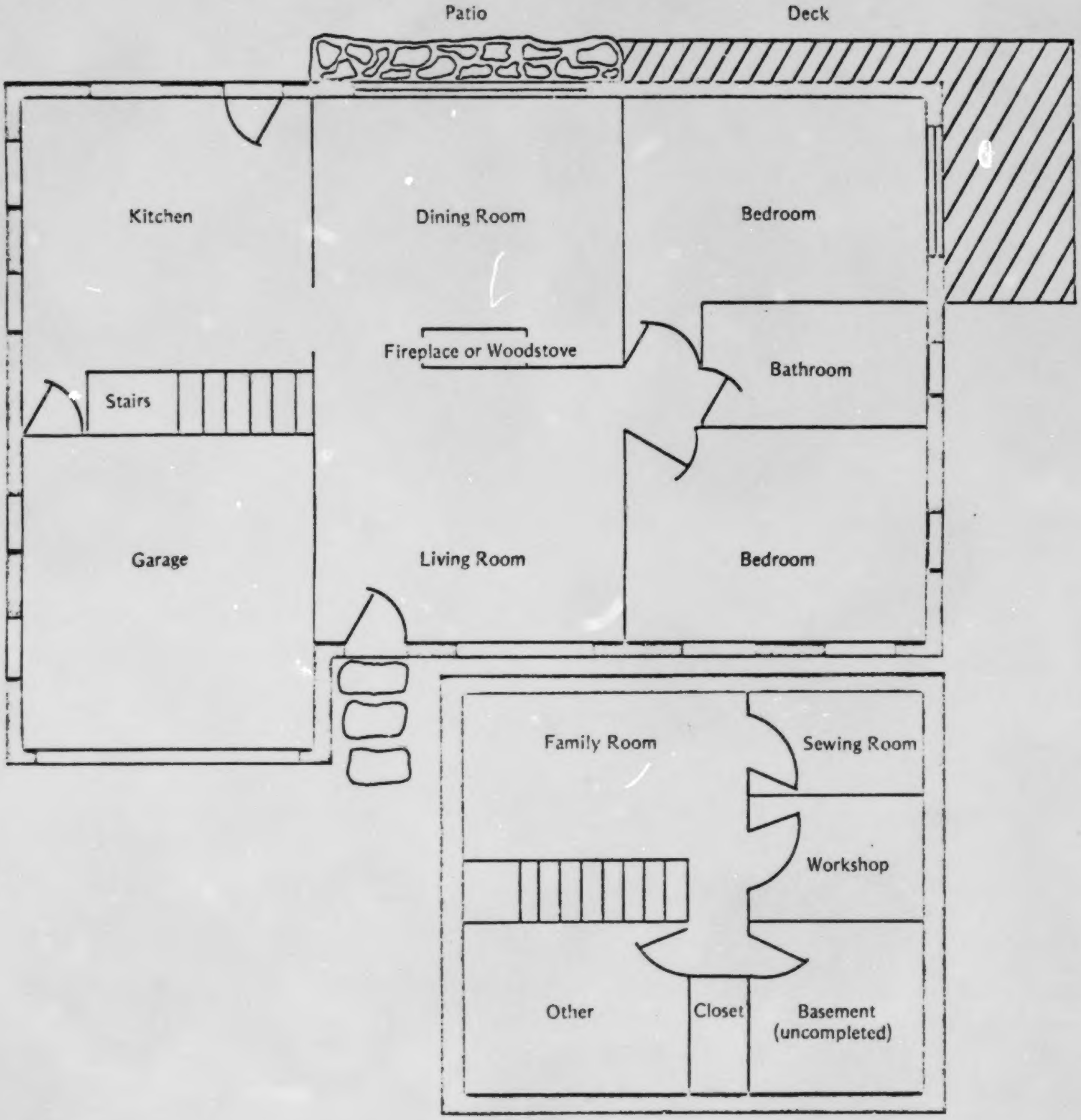
Total of Column 2 439

Survey of 25 Students

121 Items

1-8

Floor Plan of a Typical House


Patio
Deck
Kitchen
Dining Room
Bedroom
Fireplace or Woodstove
Bathroom
Stairs
Garage
Living Room
Bedroom
Family Room
Sewing Room
Workshop
Other
Closet
Basement (uncompleted)

Home Appliance Use

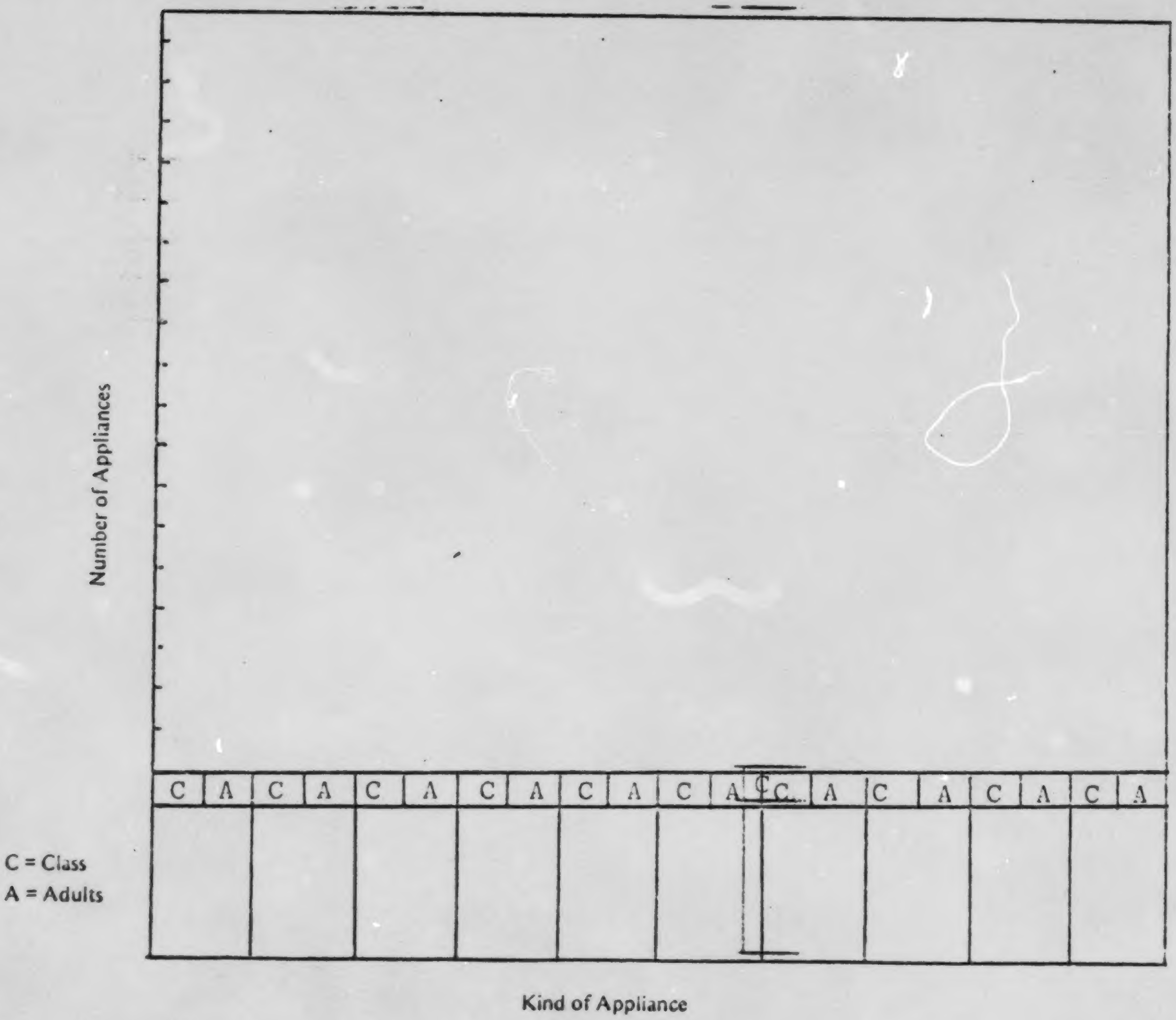
DIRECTIONS:

1. In the ten spaces at the bottom of the graph, write the names of ten different appliances.

2. Using the large floor plans on the class display, observe how many class members and adults owned each of the ten appliances.

3. Decide on what would be an appropriate number scale for "Number of Appliances" and fill in the numbers to make the scale.

4. Above each of the ten appliances, mark the number owned by class members and the number owned by adults. Draw bars to represent these numbers.



III. A Impact on Students

Students became aware that energy sources are being exhausted and that they have been much too extravagent both in the purchase of appliances and energy usage.

Their responses to the unit indicated life style changes including:

1. Wearing warmer clothing and turning heaters down
2. Wearing layers of clothing
3. Home insulation
4. Organizing refrigerator storage so family members wouldn't stand with refrigerator door open while searching for a food item
5. Decisions to turn off lights, sound equipment, etc. when leaving rooms, etc.

Their components included: "It's a choice of how you spend your money; I'd rather use the energy savings on other things." "It's just as fast to use manual can openers and knives."

III. B Basic Skills

Math

Practice calculating percentages

Basic addition

Linear metric measuring

Reading

Interpreting written instructions

Role-playing situations

Communications

Class discussions

Teaching young children

Writing

Drawing conclusions

Answering written questions

Social Science

Graphing results

Home Economics

Consumerism skills

Nutrition knowledge

Hand and machine sewing skills

III. C Impact

Practices in the School

Made the students aware that energy education was being taught

III. D Impact

Practices in the Home

1. Practice newly-learned hand and machine sewing skills
2. Projects taken home put into use to conserve energy
3. Information gained as energy consumers

IV. Teacher Motivation:

1. Student reaction to hands-on-activities (multi-sensory)
2. Use as "fill-in" item between holidays or end of semester

3. Publicize activities in teacher newsletters
4. Publicize activities in school newspaper
5. Publicize in home-town newspaper
6. Team-teaching between departments
7. Have energy units completely prepared for use
8. Displays at teacher meetings
9. Offer workshops for teachers
10. Display projects at community sites-banks, stores

HOME ECONOMICS

Georgann Seibert
Public Service Company of New Mexico
Albuquerque, NM

As a project, I chose to field test an activity from a solar energy curriculum guide for home economics developed by New York State Education Department. The activity tested was #6 "Sunny, the Solar Snake." This activity required some alteration to fit the students needs.

Since I am not a classroom teacher, I "borrowed" a class from Robertson High School in Las Vegas, New Mexico. The class which was coeducational was composed of mostly urban students with a few from a rural area. The class was a beginning clothing class (freshmen and sophomores) in which the students had just become familiar with the machine operation and basic straight stitching. The students were told that they would be doing a project related to solar energy. Prior to the lesson, the teacher received a copy of the lesson which included objectives, skills and materials needed, an instruction sheet, and an evaluation sheet.

The original lesson plan called for draft stoppers to be made and then used with young children in a play in conjunction with a study in child development. Instead, I used the lesson to help students become aware of energy waste, why they should be concerned and how, using simple sewing skills, they could conserve energy.

The students received fabric (which needed to be measured), thread, stuffing (cotton batting), and an illustrated instruction sheet. After a brief discussion on the energy situation and why, as consumers, they should be concerned, the students began their projects.

Most of the students completed the projects within one class period. Follow-up activities to be completed were the decoration (face features, etc) and an evaluation sheet.

In general, the students enjoyed this simple project. They mentioned ideas such as selling draft stoppers for FHA/HERO fund raising, Christmas gifts, and projects for younger siblings.

S*E*C*O*N*D*A*R*Y

INDUSTRIAL ARTS

ROBERT SCHUTZ - TAYLOR MIDDLE SCHOOL - ALBUQUERQUE, NEW MEXICO

MAGUIN URIOSTE - VALLEY JUNIOR HIGH - EL PUEBLO, NEW MEXICO

RAMON E. TORRES - BELEN JUNIOR HIGH - BELEN, NEW MEXICO

INDUSTRIAL ARTS

Robert Schutz
Taylor Middle School
Albuquerque, NM

The setting for Taylor Middle School located in Albuquerque, New Mexico, has the largest enrollment for a Middle School in the state. The total count is 1345. We serve the north-west valley of Albuquerque and bus approximately 95% of our students to outlining areas. Ethnic background varies widely among White, Spanish, Indian and Black.

Teaching Industrial Arts, consisting of Exploratory Arts 6th grade, and World Manufacturing 8th grade. There can be a wide variety of energy conservation which can be taught and introduced.

Public Service Company of New Mexico, was used to a great extent in showing a few of the films which they have to offer on Economics, Environment, and Energy Conservation.

After introducing basic energy conservation to my students a few had the bright idea of involving the whole school as a project to conserve energy.

Not knowing how to go about involving the whole school, I went to one of the counselors, and talked with him at length on some of the things we could do. He said he would involve the staff, administration, and students. I asked him if he would get all the information dealing with the administration, bills, gas consumption, electric consumption, etc.

I went back to the classroom and the classes decided to write up a procedure and evaluation to check their work. They said they:

1) Needed to check with administration for permission to initiate an energy program
2) Publicly address the school
3) Use student council members for classroom energy monitors and spread the word
4) Use faculty meetings
5) Visit classrooms
6) Provide materials for classes (math classes - science classes) to make students aware of costs in school as well as home
7) Check with central office for cost of bills at school before the project and see if there is any differences after the project
8) Use student monitors as a roving committee to check areas within the school to find energy being used inefficiently. Ex. lights burning in empty rooms, etc.
9) Use shops' students to count every bulb fixture in school
10) Use math teachers and students to calculate energy used and the total costs
11) Posters and signs in halls
12) Pamphlets given out through all classes
13) All rooms with "Turn me off" stickers

After the students in my class worked with this energy project, there had to be a means of evaluating their findings and effort. A long term energy cost of school gas and electric bills were collected and findings were totalled. A slight increase in electric was shown and a slight decrease in gas consumption was present. Students were impressed with most findings but at this age group (11-13) some were very disappointed at part of the findings. They seemed to expect miracles.

I think my students were very much made aware of energy conservation and its affect on society as well as themselves in their environment at home and school. But, the most positive aspect I heard out of the students was that all the students could and did work together as one for a common good.

Suggestions

1. As a group interested in motivating other Industrial Arts teachers to promote Energy Conservation, we would like to suggest points which we feel would greatly help.
2. There are sources in your schools we feel are invaluable. Check with your Home Economics, Sciences, Math and Social Studies teachers. They may all have some method of study to get you started in this vast area of Energy.
3. Outside agencies such as Public Service Company of New Mexico, Gas Company of New Mexico, etc. have many insights in such areas. Feel free in contacting these firms.

4. Colleges and Universities have many courses and workshops where teachers can update their knowledge on this subject. The state Department of Education has various pamphlets, materials and ways to motivate your students.

5. And don't forget, industry. Many teachers fear using outside industry which makes up our vast growing society. Owners and or management are only too happy to give assistance and even monetary suppliments to your school. You only need to ask.

Remember, our kids are growing up and trying to survive in a fast and troubled society. Our job is to ease this situation and provide all we can in knowledge of conserving "ENERGY" the best we can.

INDUSTRIAL ARTS

Maguin Urioste
Valley Junior High
El Pueblo, NM

Valley Junior High is located between Las Vegas and Santa Fe on Interstate 25. The school is a small rural school, serving a number of small communities and villages with a combined enrollment of approximately 200 students from kindergarten to 9th grade. The student body is composed of 99% Spanish American with deep roots of traditional Spanish families.

It is evident that Valley residents have been familiar and aware of energy conservation practices for many years. One quiet drive through the Pecos Valley area will clearly show old adobe houses on the edge of the scenic mesas with houses facing South. The reason for this was to protect the home with the mesa from the cold Northern winds in the winter and gain good warm heat from the South.

The students themselves are not really aware of most of these practices. By offering a course in energy and conservation, not only makes students aware of new areas but they can better understand some of the past. Most of the students are already in a conservative state of mind, since most are an essential part of providing for the home needs. Example: There is no natural gas in the area and little L.P. gas, therefore, students must participate at home in the gathering and cutting of firewood. Also, the area for many years, has used wind-mills. Exposing students to different propeller fans and other factors of wind energy, the student can very easily relate the school experience to the home.

One of our activities has been on wind energy. The first goal or objective was simply to make students aware of how a wheel or fan can operate with the wind. Without any doubt, students were able to see and understand this.

Another goal was to be able to see and demonstrate how design can increase or decrease function; goal accomplished.

The third and final goal will be to harness some of the wind energy on scale models. It is hoped that by adding mechanical devices, we can make wind work in an interesting and functional way to students.

The class has provided a new area of learning and without any question, the students at Valley are into it.

INDUSTRIAL ARTS

Ramon E. Torres
Belen Junior High
Belen, New Mexico

Belen is a small town located 30 miles south of Albuquerque. the Belen Consolidated School System serves approximately 3,400 students from around many small farming communities. The school system itself has one high school, one junior high, and five elementary schools. Ethnic background of the student population in the school system is approximately 65% hispanic, 34% anglo, and 1% black. About 70% of these students come from farming and ranching environments.

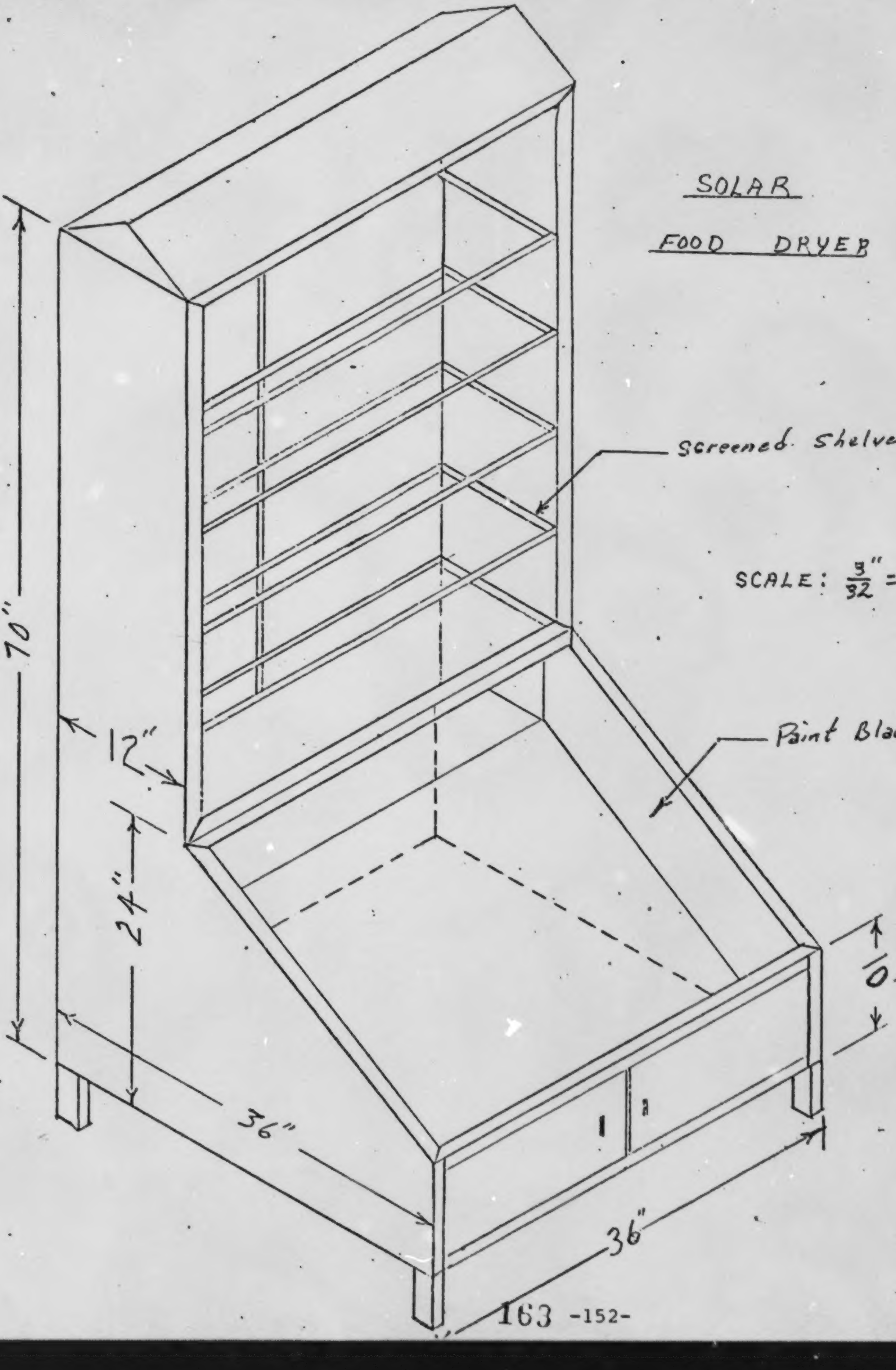
The school system has for the past few years been concerned with the energy and conservation problems facing this country. Therefore, teachers and administrators from grade levels K-12 have been attending workshops and classes dealing with these problems and then implementing them into our curriculum.

Students in the junior high science classes were given the task of trying to harness and increase the heat put out from the sun. Various prototypes of solar collectors were made and tested for efficiency. The other objective was to put some of the collected heat to use on something usefull and practical.

The problem was then given to the Industrial Arts students to design and construct a solar food dryer that could be used for drying fruit, meat and vegetables in large, in usefull quantities. After many designs and prototypes, the best and most practical was picked and constructed in full scale.

The project, we felt, was a success due to the fact that the project was carried to full size and put to real use, instead of just making 20 models and putting them in a shelf never to find out if they would have ever worked.

SOLAR FOOD DRYER


Screened Shelves
SCALE: $\frac{3''}{32} = 1''$
Paint Black
70"
12"
24"
10"
36"
36"
1
2

S*E*C*O*N*D*A*R*Y

MATH

KAREN SCHUTZ - TAYLOR MIDDLE SCHOOL - ALBUQUERQUE, NEW MEXICO

JEAN BROCK - WAGON MOUND HIGH - WAGON MOUND, NEW MEXICO

JEAN BROCK & KAREN SCHUTZ (Combined)

MATH

Karen Schutz
Taylor Middle School
Albuquerque, New Mexico

I am a teacher of 8th grade mathematics at the largest middle school in the state. The students are from very diversified backgrounds and ethnic groups - anglos, blacks, Spanish, and Indians. Many of our students are recent transfers from New York City schools and from other large metropolitan area schools in the East. There is a balance between upper and lower income levels. The school draws its population from several communities far enough away that 95% of the student body are bussed to and from the school. Because of this, after school clubs and activities that could be used for energy related projects are non-existent. Therefore, our energy conservation project centered around working within the classrooms, faculty meetings, and through the student council organization to make everyone in our school community aware of being energy conscious.

Within my own classroom, I first utilized Public Service Company to initiate our awareness of electricity - the students learned about the raw materials used, how it is generated, and how to figure its costs. Within my required course of study of "decimal" and using "formula" units, we separately figured costs for the usage of nearly all the different electrical appliances that were operated within their own homes.

The students were taught how to read their electric meters. They were also encouraged to make their families aware of rising costs and diminishing resources to get them to help conserve energy within their own homes wherever possible.

We further involved the students from the Industrial Arts department to help find the number of lighting fixtures along with wattages from each that we used daily at our school. My class then calculated electrical costs (with information from PNM) for operating our school; and decided on ways that, as students and teachers, we could conserve by turning off lights when rooms and areas were not in use.

All of this was expanded to the Student Council where the students themselves organized an Energy Committee with their own suggestions that were posted in each room to help everyone remember to conserve. Memos and posters were distributed and displayed throughout the school as reminders to all. We even went beyond the students in school and reached the community with our energy program through the parents' newsletter.

I feel that the students enjoyed their learning experience doing the various activities that were carried on during the entire year - it was a wonderful opportunity for them to realize the practical aspect of mathematics which they sometimes overlook at this age. Too often eighth graders only think of mathematics as a required subject that has very little application to their future endeavors! I enjoy teaching math as a practical tool and try very hard to bring in as much consumer and everyday arithmetic as I can into my program. So this project was another fine example for them and was a most welcomed addition! It will be a project that I plan to include each year.

Unlike teaching in a rural community in our state where children are raised with some knowledge of solar and water power, our city children take for granted all technology without regard to costs or supplies. Also, unlike the rural teacher who follows the students' progress through several years, the urban teacher does not have this continuity with the students' education. But during the one year time period that I spend with my students, I hope that I am able with the energy project, to instill a spark of interest for the future of each of my students to consider all aspects of energy and its conservation.

MATH

Jean Brock
Wagon Mound High
Wagon Mound, New Mexico

I am a Mathematics teacher at Wagon Mound High School. For the last 6-8 years, I have been interested in solarizing our rural home, an old adobe and rock building.

After I started teaching at Wagon Mound, our principal asked if I would care to attend a workshop on teaching energy at Highlands University under Dr. Hughes' guidance - this project.

Wagon Mound Public Schools have an enrollment of approximately 160 students with a teaching staff of about 12 and an office staff and administrative staff of 6. The students come from the villages of Watrous, Ocate, and Wagon Mound, and the surrounding ranch land. Many are supported by Human Services. Others are children from ranch or ranch employee families and from N.M. State Highway employees and the few school and city employee families. The ethnic background is probably 90% Hispanic.

At our schools we have done the following:

1. Shown filmstrip show on solar energy in N.M., using passive solar for space heating to students and staff. (Effective only once every three or four years.)
2. Put up posters and bulletin boards to call attention to need to conserve energy and to the great resources available to us locally - such as wood (already being

used by many), sun, wind, and in certain isolated locations, hydropower.

3. Built a solar greenhouse, which was coordinated effort of science teacher, shop teacher (shop classes built it, - it was attached to vocational building which was poorly heated, - and so needed the resultant space heat), arts and crafts teacher, and one of the elementary teachers. (Renewed efforts are needed yearly to use it effectively.)
4. Taken field trips - visiting Las Vegas solar homes, and inspecting a solar retrofit of a two room adobe in Cibollita Canyon.
5. Offered a Solar Energy class to 8th graders as an alternative science class.
6. Introduced energy and solar applications as examples of M thematics in appropriate math classes.

In a small school, we have the advantage of getting acquainted with each and all of the students and their families. I teach a class of 7th grade math, 8th grade math, 9th grade general math, Algebra I, Algebra II, and Geometry this year which is representative of my schedules. The exposure I can give in the classroom to students one year, I can give again and again, trying to build on it, and enlarge their understanding of our energy needs, resources and solutions.

MATH

Jean Brock
Karen Schutz

Motivations for other teachers to participate in Energy Education:

1. Discuss possibility of dropping energy costs for school systems as a possible increase of salaries - e.g., find more economical uses of existing buildings or instigate small solar projects as an experimentation for possible solution.

2. Visitations from participants of the Energy Workshop to other area schools to instill an interest or spark enthusiasm for projects in schools not already involved.

3. Relating energy conservation to individuals pocketbook - saving energy means saving money for each individual.

4. Have energy program for Open House situations to get parents and community involved.

5. Make teachers aware of all of the variety of classroom aids that are available through various agencies and outside speakers that are willing to make presentations as a possible additional "oomph" to their normal routine. The students get enthusiastic over a change in instruction from their regular classroom association.

6. Use this for suggestion for In-Service days for teachers.

S*E*C*O*N*D*A*R*Y

SCIENCE

CORINNE DURAN - OUR LADY OF FATIMA - ALBUQUERQUE, NEW MEXICO

SHARON HOLMES - WASHINGTON MIDDLE SCHOOL - ALBUQUERQUE, NEW MEXICO

RUTH I. CRISTO & LOUANNA R. ZUCH - MEMORIAL MIDDLE SCHOOL - LAS VEGAS, NEW MEXICO

DOROTHY V. GURULE - VALLEY ELEMENTARY - EL PUEBLO, NEW MEXICO

A. DOYLE FOREMAN - SPRINGER HIGH SCHOOL - SPRINGER, NEW MEXICO

LEROY OLSON - RATON MIDDLE SCHOOL - RATON, NEW MEXICO

LLOYD VARELA - QUESTA ELEMENTARY - QUESTA, NEW MEXICO

SCIENCE

Corinne Duran
Our Lady of Fatima
Albuquerque, New Mexico

I am Corinne Duran, I teach at a private, catholic school. The average total enrollment is about 450 students from grades 1-8. I work under a principal who not only lends moral support, but is willing to back me up in whatever way she can. Being a private school, we are limited, yet our principal will go out of her way to purchase materials and give me time off to attend workshops which will enhance the students' learning experience.

The students at our school are highly motivated to learn. This I attribute to several factors. First of all, the parents are paying for their education. Secondly, most of our students come from high-middle income families. Most of the parents are professionals and take an above average interest in their children's education. Therefore, when I approach a project such as energy, which is a community concern, the parents enthusiastically become involved.

My energy unit was done with two 7th grade classes (64 students) studying Physical Science. In preparation for this unit, the students studied about different kinds of energy, i.e., chemical, mechanical, heat, etc. and how one form of energy can be changed to another form.

My main objectives were: to make the students energy conscious, by making them aware of the energy crunch and public interest and concern. I also emphasized that this will be more of an issue in the future of which they will be a part. Make the students aware of alternative energy sources.

The take-off for this unit was a lesson using headlines about the "coal strike" in which students gave a written assessment of their own reactions to this crisis. A class discussion followed the written assessment.

The total unit was activity oriented and demanded parent and community involvement. The students were enthusiastic throughout the whole unit. They were involved in building projects from sawing, nailing and using solar projects.

The students became energy conscious through PNM workshop presentations of "Present Energy Sources" and "Future Energy Sources."

After becoming "Energy Conscious" the students researched different sources of energy; sun, wind, nuclear, hydroelectric, and geothermal. This was done through individual research and oral visual aid presentations, guest speakers, film presentation and field trip.

After this was accomplished, we zeroed in on solar energy. "Solar energy is free and can be harnessed," this was illustrated through group solar projects. The students built hot dog cookers, a flat place collector to heat water and a food dehydrator. At one point the students painted several coffee cans different colors, filled them with the same amount of water, set them out in the sun and recorded the water temperatures. This gave students an idea of how colors absorb heat. We listened to speakers that own passive and active solar homes. We also visited a solar home.

The energy unit was fun for both teacher and students, because it was activity oriented. The students had fun harnessing the sun. We cooked hot dogs, made hot chocolate with water heated in our solar collector. Our cookout was great fun for all.

ALTERNATIVE ENERGY SOURCES

Corinne Duran

OBJECTIVE: Students will become energy conscious.

Students will learn that they can use other sources other than fossil fuels.

Students will be able to list some advantages and disadvantages of: Wind Energy, Solar Energy, Geothermal Energy, Nuclear Energy and Hydroelectric Energy.

Students will build and use simple solar projects to learn first hand how they can use the sun simply and inexpensively to conserve energy.

CONCEPT: Fossil fuels are being used up and cannot be replenished therefore, we must learn to conserve energy and at the same time look for other sources of energy for use in the future. Our students will face this dilema in the future so it is important that they become aware of energy issues as soon as possible. Solar energy is free and can be made use of in many practical ways.

TIME AND SCOPE:

This Unit will take approximately five weeks for for completion. It will include the following:

1. Introductory Lesson which brings the reality of a fuel shortage. This will involve decision making.

2. Student research into Alternative Energy Sources.

3. Guest speaker to present an Alternative Energy Source which is practical and inexpensive--Passive Solar Heating---Mr. & Mrs. Bill Puttman.

4. Film Presentations
   (a.)"In Search Of" to show the development of energy.
   (b.) "Sun Power" to show advantages and disadvantages of solar technology.

5.. Field Trips
   (a.) Kirtland A.F.B. to view displays on: Nuclear Energy, Coal Gasification, Wind Energy, and Solar Energy.
   (b,) Alb. Museum--Solar Displays
   (c.)Solar Home

6. Two workshops by PNM representative
   (a.) Present Energy Sources
   (b.) Future Energy Sources

7.. Student Solar Projects:
   (a.) Solar hotdogger that students can build in 1 or 2 periods. They will cook and eat the hotdogs.
   (b.) Experiment to test the effects of color on heat absorption. Students will paint water containers different colors and plot the temperature of the water in each.
   (c.) Build a small solar collector, test it and make a graph showing variations in temperature during different times of the day.

(d.) Build a Solar Dehydrator, dry foods and sample. Compare taste and space taken up by dehydrated foods.

(e.) Individual projects

Prior to this unit the students covered a unit in their text on energy. They studied six forms of energy and their uses.

Skills which the students will develop through this unit are:

Research
Reading comprehension
Graphing
Speaking skills
Listening skills
Vocabulary bldg.

Use of basic tools
Critical thinking
Applying concepts
Gathering data
Forming hypothesis

SCIENCE

Sharon Holmes
Washington Middle School
Albuquerque, New Mexico

In an effort to increase the representation of minorities in scientific and technological careers, the National Technical Association (NTA) developed the Career Awareness Program for bright disadvantaged minority youth.

The NTA is a professional engineering and scientific organization consisting of minority engineers and scientists whose goals are to encourage professsional advancement and involvement, communicating technical information and maintaining the high level of professionalism in their field.

The participants of the Career Awareness Program (CAP) are selected by parent approval, recommendation by two teachers and a B average. Even though the emphasis was on low income students, the participants came from a variety of economic backgrounds. There were fifty students, ages 10-14 representing most of the racial-ethnic groups of Albuquerque.

Last year I was asked to coordinate the CAP program for minority students who were bright but lacked the motivation to succeed and/or were not aware of the variety of careers available in the scientific and technical fields.

Using the information and expertise gleaned from energy workshops, materials from these workshops and my experience as a middle school science teacher for Albuquerque Public schools, an outline was developed to meet the goal of the program, to encourage minority youth in scientific and technological careers and to develop an awareness of energy, sources, use, misuse, conservation and economics, and career and job opportunities.

It is the belief of the NTA that minority individuals do not enter careers of engineering and science because of the absence of role models, experiences and motivation. The CAP, therefore, includes minority role models from local industries and businesses in the community to make presentations to the participants. The students go on field trips to observe an experience the scientific processes in the work place. Student hands-on activities, demonstrations and projects are an integral part of the classroom presentation.

The classes were held on the campus of the University of New Mexico during the summer at four hours per day, four days per week, for four weeks.

The activities and field trips provided by CAP are listed on the following pages.

The evaluation of the program cannot be completed for several years after the students have determined their career selection. However, the effects of the program can be seen in increased test scores on some basic skills test, the development of student projects, the increase communication between students and scientist. The participants now include engineering and technology among their career choices when asked, "What do you want to do when you grow up?"

Sharon Holmes

ALBUQUERQUE CAP SUMMER

Classes for the summer phase of the Career Awareness Program will be held on the campus of the University of New Mexico at the Student Union Building from 9:00 to 12:30 PM, Monday through Thursday. Those days that field trips are scheduled the session may last until 3:00 PM.

All presentation will be student-oriented and include demonstrations, activities, student participation and time to ask questions. Audio-visual aids will also be used whenever possible to supplement each presentation.

WEEK I

SOLAR ENERGY

The objective of this unit is to make students aware that :

a. Energy is required for biological as well as physical changes.

b. The sun is the primary source of energy, i.e.
   1.photosynthesis
   2. water cycle
   3. wind and heat currents

c. Alternative energy sources.

d. Various solar energy systems.

e. The limitations of solar energy utilization.

f. Careers and job opportunities with the development of energy sources.

S. Holman

WEEK II

SOLAR ENERGY, NUCLEAR ENERGY, THE ENVIRONMENT

Objective :

- Students will be introduced to some of the present energy projects being developed in the State of New Mexico.
- Students will be introduced to nuclear energy and will understand general operation of a nuclear reactor.
- The environmental, political, economic and social consequences of nuclear use will be addressed.

S Holmes

WEEK III

ELECTRICITY

Objective :

- Students will become familiar with :
  1. What energy is.
  2. The use of electricity.
  3. Attitudes concerning energy use, conservation, economics and the environment.

S. Holmes.

WEEK IV

GEOTHERMAL ENERGY, PETROLEUM INDUSTRY.

Objective :

- to introduce student to more energy sources.
- to see the process of finding and developing petroleum.
- The student will become aware of the Geology of the area.
- Present and Future careers and job opportunities in the energy field will be developed.

S Holmes

WEEK I : SOLAR ENERGY

S. Holmes.

Tuesday, July 7, 1981

- Students new to the program will be tested using the Wide Range Achievement Test (WRAT) to test math skills and the Botel reading test.
- Students will discuss overview of energy.
- Vocabulary list will be developed.
- Students will read booklet : About Solar Energy.
- Students activity : to develop a game using the vocabulary list and the facts from the booklet.
- Film : Sun Power (15 min.) will be shown. Students will write a summary of the film.

Ernest Jenkins and Ronald Panebouef, educational specialists will make a presentation on solar energy, active and passive solar systems. The presentation will be student oriented and includes several demonstrations.

Wednesday, July 8, 1981

- Dr. Ms. E. Wilkins, Professor and Chemical Engineer at the University of New Mexico (UNM) will make a presentation about the Gel Pond developed by her at UNM and compared to salt gradient pond. A model of the Gel Pond will be shown.

Thursday, July 9, 1981

- Mr. John Hardy of the Southwest Resource Center for Science and Engineering will make a presentation about chemistry relating it to some of the concepts developed.
- Students will be tested on materials developed during the week.
- The presentation will consist primarily of demonstrations.

WEEK II : SOLAR ENERGY, NUCLEAR ENERGY

Monday, July 13, 1981

- Students will take a field trip to SANDIA LAB. to see the solar tower, vertical windmill, nuclear reactor and other energy related projects and to meet scientists and engineers working in these areas. NTA member, Bill Brown, will direct the field trip. Speakers will be at each of the sites for the benefit of the participants.

Tuesday , July 14, 1981

- Students will visit the Gel Pond and the Salt Gradient Pond. An UNM professor will review the fundamental of a solar collector.
- Students will begin to work on energy related projects i.e. windmills, solar collectors, work on kits.
- Film : "Taping the Source" (13 min.) features information about the sun as the primary source of energy and technology, associated with solar energy.

Wednesday, July 15, 1981

- Film : "Energy - Choices, Options, Decisions" (14 min.) on nuclear energy will be shown as an introduction of nuclear energy.
- General concepts and vocabulary will be introduced.
- David Woodall, Professor at UNM, will make a presentation on Nuclear Energy.

Thursday, July 16, 1981

- Student will continue construction of projects and/or work on Solar Kit, Inventor Kit or Dry Cell Kit.
- Film : "Second Genesis" (16 min.), film about the pollution and energy problems.

WEEK III : ELECTRICITY

Monday, July 20, 1981

- Ron Panebouef will speak on Major Energy Sources and Electricity.
- Students will do activity :"Chemical Energy from a Lemon." and do worksheets and activities related to the presentation.

Tuesday, July 21, 1981

- Energy-Environment Simulator showing relationship between man and his environment.
- Presentation on Alternative Energy sources will be presented by Dan Gerry, Educational Specialist.

Wednesday, July 22, 1981

- Students will take a field trip to the local electric generator plant, Person Station, and visit the Electric Company's business office for a tour and to see the electric arc demonstration.
  Diana Garcia, Educational Specialist will be the tour guide for these activities.

Thursday, July 23, 1981

- Ernest Jenkins, Educational Specialist will make a presentation on Electric Safety, Conservation and the Environment. The presentation will include several activities, worksheets.

WEEK IV : GEOTHERMAL ENERGY, PETROLEUM INDUSTRY.

Monday, July 27, 1981

- Errol Watson, Geologist will discuss geothermal energy, present and future use.
- Filmstrip - Geothermal Energy - will be shown.
- Demonstration and other aids will be utilized.
- Phil Carter, Geologist, will make a presentation, locating drilling, producing, refining, distributing and marketing fossil fuels.

Tuesday, July 28, 1981

- Field trip to Jemez Hot Springs, and Los Alamos Scientific Laboratory to see the geothermal generator plant projects.

Wednesday,July 29, 1981

- Phil Carter, Geologist, will make a presentation on locating, drilling, producing, refining, distributing and marketing fossil fuels.
- Field trip to Philip. Uranium Mines, drilling sites, Liquid Petroleum Plant, Ceneza Refinery. Travel time will be spent observing and discussing the geology of the area with a guest geologist.

Thursday, July 30, 1981

- Students complete energy related projects.
- Students will use computers at the Career Enrichment Center to find specific information about careers discussed during the summer session. (Guidance Information System - GIS)
- Students will be tested on material presented during this week.

S Holm

NATIONAL TECHNICAL ASSOCIATION
CAREER AWARENESS PROGRAM TOUR
July 13, 1981

9:30	Visitors arrive
9:30 - 9:45	Welcome: Bill Brown, Member Technical Staff Computational Physics & Mechanics Division
9:45 - 10:05	Film: "Working Today for a More Secure Tomorrow"
10:05 - 10:20	Break
10:20 - 11:50	Tour: Reactor Development & Applications Department, Area 5 Hosts: O. F. Padilla B. F. Estes, Reactor Applications Division
11:50 - 12:00	Bus to Coronado Club
12:00 - 1:00	Lunch
1:00 - 2:00	Tour: Laser Analytical Spectroscopy Division Bldg. 893 Host: A. W. Johnson, Manager
2:00 - 3:00	Solar Tour: Mid Temperature Photo Voltaic Wind Turbine Solar Power Tower
3:00	End of tour

SCIENCE

Ruth I. Cristo
Louanna R. Zuch
Memorial Middle School
Las Vegas, New Mexico

Setting: Rural-Urban 200 students

Make-up: The majority of our students come from a low socio-economic group. Ninety percent of our students are Spanish surnamed and about 75% come from one-parent homes.

The students' reading and basic skill levels average 1-2 grades below grade. Motivation among this group is very low.

We worked with all 7th graders at Memorial Middle School which totaled about 200 students.

Objectives: Students will become energy conscious, students will become aware of how recycling is beneficial to the environment and the economy, students will develop the following:

Skills:

reading comprehension
speaking skills
listening skills
vocabulary building
graphing
gathering data
forming hypothesis
applying concepts

Time and scope: 2-4 weeks

Procedure: We used a unit in our text as a basis for our project. We supplemented the chapter with a film from the state film library "Resource Recovery" and a set of two filmstrips, Story of Science and Technology and Recycling and Ecological Study.

We motivated our students by having a poster contest and an aluminum can drive. The individuals with the best posters were recognized and the class and individual with the most cans were rewarded with a party an extra credit. Students spoke on recycling over the radio station.

Other content areas integrated into our project were Art, Math, Social Studies, and Language Arts.

Teacher Evaluation:

Quizzes

Tests

Peer Evaluation

Discussions - speaking over radio

The students enjoyed the unit on recycling. Ninety percent of the students passed all requirements. They really enjoyed having the work displayed and evaluated by the other teachers and students. The high point was the pizza party which ended our unit.

The students motivation was very high and we felt our objectives were reached.

SCIENCE

Dorothy V. Gurule
Valley Elementary
El Pueblo, New Mexico

Setting: Rural 20 students

Make-up: Low Socio Economic

98% Spanish surnamed

80% Spanish speaking

Objectives: Make students aware of uses of energy, emphasizing wise uses of energy, and different sources of energy.

Procedure: Students were introduced to present sources of energy used in homes and school. They also were made aware of alternative sources of energy.

After viewing filmstrips, listening to lectures, and class discussions, students presented oral reports concerning each energy source and alternative sources. They used materials and information from the Energy Workshops I attended in 1981 and 1982.

Class project: Emphasized Solar Energy

Divided class into five groups.

Each group developed their own plans for building models of solar homes. They made a blueprint and provided their own materials for constructing their models. Each group was responsible for explaining to the class how their home would use solar energy to best advantage.

Time of project and unit: 4-5 weeks

Materials used:

1. materials from workshops
2. filmstrips - PNM
3. lectures
4. oral and written reports

Materials used for project (provided by students)

1. cardboard boxes
2. insulation material
3. clear plastic for windows
4. small pieces of wood
5. electrical tape

Evaluation:

1. teacher made tests
2. teacher observation

Students especially enjoyed constructing their model homes. There was a lot of interaction within each group as they worked and were proud to share their project with others in the classroom and other classes as well.

SCIENCE

A. Doyle Foreman
Springer High School
Springer, New Mexico

SPRINGER: 5850 ft., 60% Spanish surname, 40% anglo, 30% bus students, 70% town, 8th grade Physical Science & Energy, 9th grade Earth Science

Energy is stressed in both grades with emphasis on solar. More time is taken in the 9th grade to stress energy.

I had each student build a small (250 ml.) solar water heater for a contest to see which heater was most efficient. The three heaters which heated the most in the allotted time during one class period got three "100's"; the next five got two "100's", with each builder getting one "100". These water heaters were built with cardboard, styrofoam, fiberboard, or wood with plastic or glass covers. All were painted black. Each student furnished his/her own container, aluminum, tin can, or plastic.

After the contest, we discussed in the classroom why each winner won and why some of the other's didn't. For two years, I took my 8th grade classes to my house on a field trip to see my solar greenhouse and solar hot water heater for preheating water. We use solar hot dog cookers for lunch. This takes from 11:00 a.m. 'til 2:00 p.m.

SCIENCE

LeRoy Olson
Raton Middle School
Raton, New Mexico

I am LeRoy Olson and I teach at Raton Middle School. I teach seventh grade earth science classes. This project of energy and energy conservation was integrated into the existing program that I have taught for several years.

The setting for this program is in Raton, New Mexico, a town of about eight thousand, in the mountains of North-eastern New Mexico, about seven miles from Colorado. The basic employment in the area is the coal mines, ranches, several small electronic firms, and the CO_2 exploration and development projects. This is an excellent area to have an energy project because there is quite a bit of solar collection in use throughout our community. The use of coal to generate our own electricity is also a factor in the project.

The entire community is really a unit and all of the children in the seventh grade have the same 7th grade science teacher, me. So there is a very broad range of ability and parent involvement in the program.

The program which I presented was basically a unit which included:

1. gaining knowledge
2. the ability to use the knowledge
3. projects made by students

4. field trips to coal mine
5. short evaluation for student
6. evaluation of program by teacher

The emphasis placed on the solar and fossil fuels showed up in the projects of the students. Most of them dealt with solar energy and its uses. Some of these were

greehouse models
cold frame garden
solar water heaters
solar houses
solar cookers
wind mills for water
wind mills for electricity
solar powered cars
water wheels
hot air balloon

These projects were built by the students. They were presented by that student to the class in which they were assigned. The student explained how it was built, how it worked, and how energy was conserved. This was an oral presentation with demonstration to the class. After this, I presented the materials, from a written report prepared by the student, to the students of other classes. A short quiz for information was given later.

Dr. Hughes came to our school and the members of my first period class gave a report on each project, regardless of whether they had made the project or not, to him. In this way they indicated that the knowledge had been given from class to class.

The most exciting part of the project was the field trip to the coal mine. Every student was taken on this trip.

This trip also involved a great deal of parent involvement, as I would not start out with that large of a group without a large number of sponsors. I made sure there was a teacher and four parents on each bus. I must say that the outcome and the reports from the community were excellent.

The cooperation of the persons at the mine was excellent. The students saw a film, made at that mine, about the underground mining procedures. They recognized a great number of the persons in the film. They were allowed to see the conveyor belts, the washing, the loading on a train of the coal, the stripmine and the reclaiming of the terrain. These tours were conducted by the persons from the mine.

The outcome was excellent as a great number of these students will return to work in the mines.

The power plant in Raton is powered by coal. This is an excellent opportunity to view the completion of the process of energy consumption, rises, and conservation.

The program was excellent in itself and I shall try to improve upon it as it is used again.

SCIENCE

Lloyd Varela
Questa Elementary
Questa, New Mexico

Questa is a rural setting consisting of small farms which include: livestock raising, small grains (alfalfa, small gardens, etc.). Questa is located in North central New Mexico with an elevation ranging from 8,000 to 9,000 feet above see level. The major employer is the MolyCorp mine employing about 75% of the workers in Questa.

The population is 2,500 with average income. Most school students live within a radius of 35 miles and are bussed to school.

Students involved on the energy unit range in age; 11-14, 7th and 8th graders. Students participating on energy project will spend about six weeks on the unit. There are about 200 students involved on the energy project. The school district is on a four-day week attendance throughout the winter months.

ENERGY UNIT PROJECT OUTLINE

I. Unit Goal

Students will gain knowledge on the areas of energy resources (renewable and non-renewable). Students will also gain knowledge on energy consumption, different types of energy sources and their utilization on Industry, transportation, recreation, and the home. Students will learn the importance of energy conservation and the methods and application on How to Conserve (wisely) our energy resources.

II. Energy Project Activities - Learning

A. Classroom

1) Introduction - Energy resources and conservation. Reading and discussion sessions. Research information by students vocabulary terms, data, etc.

2) Poster construction, wind mills, solar house models layout and design

3) Films - discussion

4) Energy project materials

energy literature information

films

texts

resource people

problem solving and decision making

kilowatt hours on meter readings

III. Field Trip Activities

A. Tours of Molydenam Mine

B. Solar homes and greenhouses

C. Los Alamos Labs

D. Bandalier National Park (solar application of the past

One day community clean-up by the students - interest awareness, collecting of recyclable materials by individual students

School open house - parents observed student energy projects at the school - community awareness

Energy posters distributed and displayed at local businesses throughout the community

IV. Resource People

1. State Game and Fish
2. U.S. Forest Service
3. Soil Conservation

V. Energy Evaluation

1. Unit test
2. Project model construction and display
3. Total energy unit participation and involvement by each student

VI. Conclusion - Impact on the Students and Community

1. Awareness of the energy shortage
2. Students were informed on the methods and applications of conserving energy at home and outside the home

VII. Skills Learned by the Students

1. Gaining positive attitudes towards conserving energy
2. Reading comprehension
3. Vocabulary understanding
4. Research applications
5. Self discipline on conserving energy
6. Distribution of information in the community
7. Use of basic tools in constructing energy projects

SCIENCE

During the energy conference at Pendaries, the Middle School science teachers met and came to a consensus of the major impacts that our Energy Workshops had on both the students and community. This was achieved through the sharing of various experiences.

The students became aware of the energy crisis and the need to conserve. This was done through the use of projects and demonstrations in the classrooms of Northern New Mexico.

Along with this, the student and community became aware of the need and value of recycling materials. Sixty-six dollars were raised in Las Vegas by the students of Ms. Zuch and Ms. Cristo in an aluminum drive contest.

In Las Vegas, Springer, Albuquerque, Questa and Raton, solar projects were set up and viewed by the students and community. (Mr. Foreman, Mr. Varela and Ms. Gurule)

Through these, the students and community became aware of the value of solar energy. The uses, costs, advantages and disadvantages were learned. In Albuquerque, at least three solar additions were built as a direct result of Ms. Duran's energy unit.

Through a variety of field trips, Ms. Holmes' students became aware of job opportunities offered by industry. Two of these are Sandia Labs and P.N.M. Other examples of employment were presented to Mr. Olson's class on their field trip to the coal mines near Raton. Speakers are available from these industries which will come into the school building upon request.

Sources to relay materials, other than classrooms, which were used were radio coverage, newspapers, building projects, t.v. coverage, and contests. There was an effort to present the environmental, political, social, and economical consequences of energy use and misuse. The impact of these will affect every facet of our lives.

1. Reading and language arts skills
   reading comprehension
   research
   vocabulary
   writing - journalistic skills - newspaper
   understanding and applying concepts
2. Oral presentations
   speaking skills
   listening skills
   public communication - radio
   debate
3. Artistic skills
   creative thinking
   models - working models
   design - blueprint, poster
   visual aids - illustrations
   visual expressions - poster
4. Math skills
   metric measuring
   graphics

concepts of math - application of concepts

comparisons

analyze

statistics

5. Social Studies skills

   geography

   environment

   life styles

   economics

   careers and job opportunities

6. Science skills

   defining problems

   get information - research

   educated guess

   test - experiment

   obtain results

   draw conclusions

The middle school science group also derived some suggestions which would help motivate the teacher to teach energy conservation. We all agreed that our own interest in energy conservation was initiated primarily by the energy workshop given at N.M.H.U. We all agreed that more of these workshops should be given in order to reach more teachers. Other sources could be implemented for workshops, such as PNM, REA and PSNM.

We all felt that in some cases, more financial assistance would motivate the teacher, students, and community. Furthermore, this would make the availability of materials and resource people more accessible to the teacher.

We also agreed that the following would provide teacher, student and community motivation:

1. Schoolwide energy week
2. Competitions, i.e., poster, aluminum drives, and debates
3. Administrative backing
4. Community backing
5. Industry backing
6. The sharing of teacher ideas and resources

S*E*C*O*N*D*A*R*Y

SOCIAL STUDIES

ALFREDO DOMINGUEZ - PENASCO HIGH SCHOOL - PENASCO, NEW MEXICO

EUGENE GARCIA - VALLEY JUNIOR HIGH - EL PUEBLO, NEW MEXICO

SOCIAL STUDIES

Alfredo Dominguez
Penasco High School
Penasco, New Mexico

Setting: Penasco, New Mexico is located in the north-central part of the state. The elevation is 7,700 feet. Subsistency ranching and farming community. The ethnic makeup is 99% Hispanic. Major employers of the area are: the public schools, U.S. Forest Service, State and County services, i.e., highway and road maintenance. Approximately 30% of the population is on welfare, few work on migrant occupations such as agriculture, mining and construction. The main source of heating and cooling fuel is wood. All homes have electricity and most homes has L.P. gas.

School setting: The main building was built in 1950 of cinderblock construction with approximately 40% of the walls covered with windows - little insulation and highly energy inefficient. The student population is 800 (district) with 99% Hispanic. Faculty are 80% Hispanic.

Description of project done through the Northern New Mexico Energy Education project:

Title of Lesson (concept) - Methane Generator

Time & Place - On-going-part-time over a period of three months. Penasco schools.

Project Goal - Students will learn to set-up a methane-gas-producing demonstration

Student Performance Objectives: Following exercise students will:

1. Students will learn how methane gas is produced
2. Students will learn to set up a demonstration to show how methane gas is produced

Materials Needed: Manure (cattle or horse)

4 1-gallon bottles

4 20-inch long pyrex glass tubing (1/4 inch diameter)

4 50-ml. test tubes

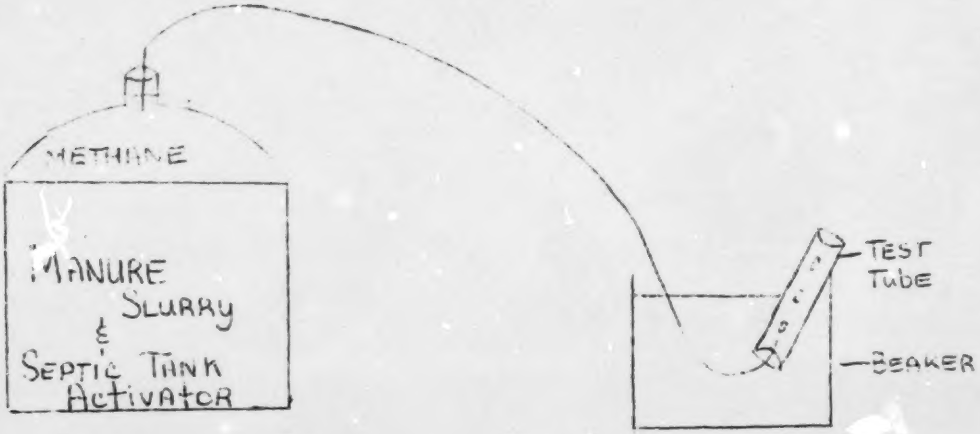
4 500-ml. beakers

4 one-hole rubber stoppers

(For four student lab stations)

Lesson Outline/Tasks (Initial Lesson:

1. Explain to students that methane is produced by decaying organic matter in the absence of oxygen. Review with students works of other people who have used methane generators to produce gas for cooking. Cite examples of word done by people of the People's Republic of China, India and other Third World Countries, and experiments dealing with Bio-gas production in the U.S.
2. Lab set-up: Fill the four one-gallon bottles with dry manure and pack the manure down with a stick or glass rod. Fill the rest of the bottle with water. Set up the apparatus as illustrated on the following page:



Place the bottle and accompanying lab-ware in a warm place. Check the bottles at the end of every week for 6 to 8 weeks. Students will make notes of their observations. After enough methane has been produced, students will test the gas produced by holding a match over the inverted testube. If the gas produces a "pop" or mild explosion when ignited then the experiment has been successful. Encourage some of the more eager students to explore the idea of expanding the generator to a larger capacity by using a 55 gallon drum as the fermenting container to produce enough gas to cook a full-course meal. (Caution: this should be done only under adult supervision.)

Evaluation: Experiment or demonstration worked according to expectations. This year, four students have begun to build the 55 gallon capacity generators. Since it is inpractical to bring the generators to school, the experiments will be conducted at the student's home under their parents' supervision with the teacher serving as a consultant. It is hoped that both experimental set-ups will be as successful as the small scale classroom model.

Even though this experiment is primarily a Science course activity, it can also be adapted to other disciplines such as Home Ec, Industrial Arts and especially Social Studies where students will learn how people in Third World Countries utilize animal waste products to produce fuel for cooking and at the same time return the "digested" wastes to the soil where it enables plants to grow without the use of fossil-fuel based chemical fertilizers.

An experiment or activity such as this could also be incorporated into the field of Environmental Education to teach the concepts of nature's way of recycling organic matter and to create a stronger awareness of how man can better preserve or improve his physical environment by recycling organic waste products, and by recycling his own man-made "throwaway" objects such as cans, bottles, and other metal and non-metal objects.

It is also hoped that such an activity or demonstration will enable students to gain a better understanding of the process of energy and matter transformation from one phase to another.

SOCIAL STUDIES

Eugene Garcia
Valley Junior High
El Pueblo, New Mexico

The community of El Pueblo is along the Pecos River, with the major income being that of going out and working in the construction field. They also have some people that are in the Migrant process of working in the seasonal crops.

Some of the people (about 3%) have their own cattle ranch with about 50 head of cattle off and on.

CLASSROOM SETTING FOR One Lesson on Energy - Science

I. Goals and Objectives

A. Students will be introduced to the major concepts of the energy crises: history, population growth, social and economic factors, and renewable and non-renewable energy resources.

II. Objectives

A. Students will gain an understanding of the historical use of energy in the United States.

B. Students will gain some knowledge of how population growth affects energy resources.

C. Students will have some knowledgeable aspects of how the lack of energy resources affect the social and economic changes in the Community.

D. The students will demonstrate an understanding of the concepts of the renewable and non-renewable energy resources within the surrounding area.

III. Goals and Objectives

A. Students will be able to list in chronological order the areas that relate concepts to that of life and Social Science to renewable and non-renewable energy resources.

IV. Objectives

A. The theory of energy.

B. Students will demonstrate an understanding that almost all of earth's energy comes from the sun in one form or another, direct or indirect.

C. Students will be able to demonstrate how the formation of coal, its uses and its effects on human health or the environment affect affect the population.

D. The students will demonstrate an understanding of the natural processes involved in the formation of petroleum and natural gas, their economic importance and their rapid depletion.

E. Students will gain an understanding of the history in the production of electricity from water, uranium and fossil fuels.

F. Students will learn through demonstrations and experiments the effects of solar energy on certain materials.

G. Students will learn to construct working models of wind driven devices.

Impact Statement: Ever since the late 1800's and the early 1900's the consumption of fossil fuels have doubled in the U.S. every ten (10) years. In the United States, it is known that the demand has increased faster than our new discoveries of oil and natural gas. The direction of the United States has changed in the past few years from relying on the petroleum import aspect. We must learn to fill the gap between our energy needs and supplies.

But what about the future? Where will we find more fossil fuel in the ground? What are the new energy sources that we must develop - like oil, shale, solar and geothermal? The most important question that we have to answer is that of energy conservation. The utmost factor in energy conservation is that of the community as a whole.

Junior high school students should be made aware of the existence of alternative energy sources and should be introduced to the various practical ways in which these energy resources are put to work, as they are the ones who will inherit the results of our present indifference to fossil fuel conservation and our lack of long-range energy planning.

Students should also be sensitized to the fact that our traditional sources of fossil fuels are very limited and could become exhausted in the very near future. It is possible that we are talking about 100 years. This should be done in respect of the area that you are teaching.

SUMMARY

SUMMARY

The Northern New Mexico Energy Education Project closed on a high note with the follow-up Conference at Pendaries, New Mexico on October 1 and 2, 1982.

Thanks to the excellent support from the U.S. Department of Energy the Project was able to indirectly reach in excess of 2000 students. Special appreciation is due to Mr. Donald Duggan of the U.S. Department of Energy, Mr. Bev Graham and Mr. Joseph Baca of the New Mexico State Department of Education.

Some dreams did not materialize. For awhile it appeared that teachers from the Project would be involved with the Center for International Development, New York City in efforts to promote Energy Education in the Dominican Republic and in Jamaica. Foundation support for this "extra" simply did not develop.

On the other hand, the University has gained a reputation of excellence throughout the State for its work in promoting teaching Education on energy-related issues.

While the Project is over, its efforts will continue. The University will be hosting the State Math and Science Teachers Convention in late January 1983 and there will be a presentation on the Project at that time. Any remaining curriculum materials will be distributed to the participating teachers at that occasion.

Finally, the Director wishes to express his gratitude to Dr. Werner Muller for his unfailing help as the Assistant Director, and to Barbara Ray, graduate assistant for her patience as workshop facilitator, and to Margaret Gonzales, Project Secretary for all her clerical help.

Orval D Hughes

Orval D. Hughes, Ph.D.
Project Director
Las Vegas, NM

December 1, 1982

APPENDICES

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NORTHERN NEW MEXICO ENERGY EDUCATION PROJECT

FOLLOW-UP

CONFERENCE

PENDARIES, NEW MEXICO

PENDARIES LODGE

OCTOBER 1-2, 1982

Pendaries Village

PROJECT OBJECTIVES

1. To improve teachers' knowledge of energy-related subject matter and energy-related educational materials.
2. To develop continuing communication and cooperation between elementary and junior high staffs and the University on energy-related matters.
3. To provide follow-up technical assistance to teachers at the classroom level, so that their students may be better informed regarding energy issues, thus preparing them for their roles as citizens and consumers and providing them a foundation for pursuing careers in energy-related fields.

NON-DISCRIMINATION

"In selecting individuals for participation and otherwise in the administration of this Project, New Mexico Highlands University will not discriminate on the grounds of race, creed, sex, color or national origin of any applicant. This project is supported by the Department of Energy through its office of Education, Business, and Labor Affairs."

A*G*E*N*D*A

FRIDAY, OCTOBER 1

6:00-7:00p.m.	Registration
7:00-8:00p.m.	Dinner Meeting
8:00-9:30p.m.	Evening Session (Large Group)
	A. Overview Introductions
	B. "Crunch the Energy Dragon" Carol Kreis, Bandelier Elementary School
	C. PNM Update Georgann Seibert
9:30-10:00p.m.	Small Group Get Togethers

SATURDAY, OCTOBER 2

7:00-8:00a.m.	Breakfast Meeting (View Displays)
8:00-8:30a.m.	General Session (Large Group)
	Preparing for Final Report Orval Hughes, Project Director
8:30-10:00a.m.	Small Group Get Togethers
10:00-10:15a.m.	Break
10:15-11:45a.m.	Small Group Get Togethers
12:00-1:00p.m.	Luncheon Meeting (Progress Reports from Each Group
1:00-2:15p.m.	Small Group Get Togethers
2:15-2:30p.m.	Break
2:30-4:00p.m.	Small Group Get Togethers
4:00p.m.	Adjournment

School
Gifed Class,
Animas Elem. School
1612 Hattur Ave.,
Farmington, N.M. 87401
Feb. 2 1962

Dr. Orville Hughes
Highlands Univ.
Las Vegas, N.M.

Dear sir,

During our studies of energy we have compiled a list of sources of alternatative energies we would like some brochures and any other available information dealing with these areas. geotermal, atomic, hydro-eleatrec, wind, tidel, kinetic, conservation, efforts, waste energey, static electricity.

Thank you very much

Sincerly yours,
Mark Moore

Gifted Class
Animas Elem. School
1612 Hutton Ave.
Farmington, N. M., 87401
Feb. 1, 1980

Dr. Orville Hughes
Highlands University
Las Vegas, New Mex.

Dear Dr. Hughes,

During our studies of alternative sources of energies we have compiled a list of energies sources that we are interested in. If you have any infromation in these areas will you send it to us. These are the areas we are interested in, geothermal, atomic, hydro-electric, wind, tidal, kinetic, waste energy, and static electricity.

Thank you very much.

Sincerely,
Erica Billingsley

HU gets energy grant

New Mexico Highlands University has been awarded a one-year $10,000 U.S. Department of Energy grant to teach energy conservation to elementary and junior high school instructors.

"The objective of the Northern New Mexico Energy Project is to show elementary and junior high school teachers how to teach the basic skills (reading, writing, and arithmetic) through energy education," explained Dr. Orval Hughes, education professor and director of the project. The project is scheduled to begin in September 1981.

New Mexico Highlands was the only institution in New Mexico to receive funding from the DOE. This project was selected from a total of 361 proposals submitted from universities across the nation.

Under the conditions of the grant the NMHU Department of Education will conduct four teacher workshops that will reach approximately 100 northern New Mexico teachers. Each workshop will consist of two and a half days of concentrated energy conservation study.

"After this workshop, these teachers should be able to teach energy conservation so that junior high students are able to do an energy audit on their school building and develop a plan to increase conservation in that building," stressed Hughes.

Teacher participants in the workshop will receive two graduate credits for attending the workshop and completing the required follow-up assignments in their individual classrooms. The grant will pay the NMHU tuition for all teachers attending the workshops.

Groups taking part in the presentation of the workshops are: Los Alamos Scientific Labs, Sandia National Lab, Luna Vocational Technical Institute, Public Service Company of New Mexico, Gulf Oil, Gas Company of New Mexico, and the State Department of Education.

NMHU professors involved in presenting the workshops are Dr. Ronald Clark, chemistry; Dr. Larry K. Sveum, chemistry; Dr. Fred Yarger, physics; Dr. Anthony F. Gallegos, environmental science; Dr. Tony A. Gallegos, education; Dr. Michael Olsen, history and political science and Dr. Werner Muller, education professor and the assistant director of the project.

In April, Dr. Hughes will travel to Washington, D.C. to participate in a DOE project directors meeting.

This grant is a renewal of a project the NMHU Education Department implemented approximately two years ago.